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EP 185

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HIBERNIA
ENVIRONMENTAL ASSESSMENT
PANEL

COMPENDIUM OF COMMENTS RECEIVED
ON
TECHNICAL REVIEW
OF THE
HIBERNIA DEVELOPMENT PROJECT EIS

AUGUST, 1985



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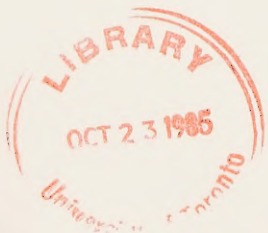
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GENERAL COMMENTS
TO
THE HIBERNIA ENVIRONMENTAL
ASSESSMENT PANEL

BY
THE PROVINCIAL ADVISORY COUNCIL
ON THE STATUS OF WOMEN,
NEWFOUNDLAND AND LABRADOR

AUGUST 1, 1985



The Provincial Advisory Council on the Status of Women
Newfoundland and Labrador

August 1, 1985

The Hibernia Environmental
Assessment Panel
c/o Bonny Hill
345 Duckworth Street
St. John's, Nfld.
AIC 1H6

To the Hibernia Environmental Assessment Panel:

You will find enclosed an overview of the major comments and concerns the Provincial Advisory Council on the Status of Women has with regard to the Hibernia Environmental Impact Statement and the Information Sessions.

These will be presented in detail along with other comments, at the public hearings in September. It would be appreciated if the panel would respond to these points.

Sincerely,

Ann Bell

Ann Bell,
President

AB/lw
Enclosure

Before commenting on the EIS, a few points must be made about the Environmental Assessment Process.

The process is not achieving the results it should with respect to raising women's awareness of their changing role in offshore oil development. Part of the problem is the high-powered approach taken at the information sessions. Most women who have never done any public speaking are uncomfortable with microphones, cameras, being recorded, and having to face a dozen or so well-educated, articulate people in order to ask a question. In reviewing the transcripts it can be seen that, excluding St. John's, only 14% of the questions posed in the Information Sessions were asked by resident women. The information sessions would have been far more successful in terms of women's involvement had a Mobil representative held prior women's meetings to discuss Hibernia and its attendant job possibilities.

Another problem with the process is the difficulty in obtaining the EIS document. Even after the initial delays in having adequate numbers of documents printed, there is still the difficulty of setting aside the several days it takes to sit in the local library, Town Council Office, or, in at least one instance (Come By Chance) the grocery store, and read the volumes. In most instances the EIS is a reference document and cannot be taken home and read. There are very few women in the Argentia and Come By Chance impact areas who have read the document; eg. Betty and George Gilbert of Come By Chance who have the EIS in their store have

have confirmed that nobody in town has read it.

One cannot assume however, that women in rural Newfoundland are not interested in learning or asking questions about Hibernia. Women interviewed from Fortune, Grand Bank, Spanish Room, Rushoon, Marystown and Come By Chance enquired about job and business opportunities, and expressed concerns about hiring practices and job requirements. Very few of these women had even thought of attending an information session. Most admitted to feeling intimidated by the formal nature of the sessions.

In response to questions on women's issues which were posed at the Information Sessions, a member of Mobil's Public Affairs Department often mentioned the "Intermittent Spouse Syndrome" study and the "Women and Oil" conference which is scheduled to take place in September. Unfortunately, those women who would benefit greatly by attending such a conference, namely the women in the rural impact areas, cannot afford the \$60.00 registration fee, travelling, meal and hotel expenses. A group of women from the Burin Peninsula, Come By Chance, and Argentia Impact Areas have expressed interest in attending the conference, if their expenses could be subsidized. It is feared that this important conference will be merely an academic exercise if most of the participants are drawn only from St. John's.

It is also unfortunate that information which will be available at this conference could not have been incorporated in the EIS, as there is almost no information relating to

women's changing roles in offshore oil development. This is seen as a critical gap in the Environmental Impact Statement. While it is encouraging to see and hear the expression "person-years" instead of "man-years" in the EIS and in the Information Sessions it is discouraging that Mobil does not mention once in the EIS that it is an equal opportunity employer. There is only a vague reference in Section 4.2.7, p. 218 that Mobil will "extend a full and fair opportunity for participation to qualified members of employment disadvantaged groups". The Provincial Advisory Council on the Status of Women would like to see an Affirmative Action Program implemented whereby a certain percentage of the available jobs would go to qualified women. While there is not yet a large number of women training in non-traditional fields, this would undoubtedly change if women felt they had a real chance at being employed in these categories.

Section 4.12.3.3, p. 333, "Women in the Work Force", is brief, only two paragraphs. It also represents a traditional view of women that isn't entirely acceptable in this age. It is as follows:

"Most jobs in large construction projects are in traditionally male-dominated and semi-skilled trades and professions (for example, engineering, construction, welding, electrical, and manual work). Although women are no longer actively discouraged from entering these professions, the number with appropriate

training and experience is still small. Direct employment for women in large construction projects is, therefore, more likely to be concentrated in the traditionally female-dominated occupations such as secretarial, administrative and catering services.

Because of family responsibilities, women are generally less mobile than men when searching for work opportunities.

Mobility can also be hindered by a lack of good daycare services and after-school care. In practice, this means women often have to work near their home communities while relying on relatives or friends to take care of their children."

Perhaps the number of women with appropriate training and experience in the skilled and semi-skilled, male-dominated professions is still small. This picture could change dramatically within the next five years, with encouragement and guidance from Mobil and the Provincial educational system. The above paragraphs are only concerned with those women who have "family responsibilities", and do not mention the percentage of women which is unmarried, married with no children, or whose children have grown up. These women would have as much mobility as men in the work force, and yet job possibilities for them are not mentioned. In summary, the EIS

accepts things as they are and doesn't offer any hope for change. Although it is encouraging that members of Mobil's Public Affairs Department have visited high schools and have encouraged young women to enter non-traditional fields, other age groups of women should be given the same opportunity to learn about employment potential and Mobil's hiring practices.

Another point of concern is the impacts the development will have on social services such as daycare, transition homes, alcohol and drug dependency clinics and subsidized housing. In the background report by IDP Consultants entitled "Impact of the Hibernia Development on Community Services and Social Infrastructure in Newfoundland Vol. II", p. 5.2, 5.3, it is written, "Many individuals and agencies interviewed by the consultants expressed the view that a needs assessment must be completed for various social service areas in order to provide a realistic understanding of the baseline situation... The lack of detailed baseline information and the lack of information on planned future services meant that the analysis of potential impacts focused more on issues of concern than facts. Hence the analysis is more qualitative and subjective than quantitative and objective." Unless a needs assessment is made of transition homes, subsidized housing, daycare, and alcohol and drug dependency clinics, there can be no accurate projections made of future needs when Hibernia is developed.

It is also wondered why "certain internal reports prepared by the Department of Social Services on the implications of offshore oil development on social services were not made available for use by the consultant" (Ibid. p.5-3).

A question arises as to how onus is identified when new or increased social service programs are implemented. While it is clear that Mobil is not responsible for providing support to current caseload levels, how is responsibility determined when there is a pressing need for, say, another daycare, or another alcohol and drug dependency clinic within the impact areas?

One last concern is the definition of the impact areas themselves within the EIS. It is wondered why Spanish Room was not included as an impact area, since the building of the Cow Head Wharf for servicing the supply vessels and the drill rigs, is such a massive undertaking. The steep, narrow road is in desperate need of upgrading and repair, as it was never designed for the numerous ten ton trucks travelling on it to and from the site. Residents are afraid for their children, who travel to and from school twice daily over the same road. They fear a ten ton truck travelling on this road might lose control and collide with the school bus. They have approached various provincial departments, but have received no word about whether or not the road will be upgraded. They also have concerns about workers who will be stationed in their area to service the vessels once the facility is built. Unlike Marystown, this is a community

which is unaccustomed to and unprepared for a large influx of people and equipment.

To summarize, there are serious problems both with the Environmental Impact Statement and with the Assessment Process. These are as follows:

- The formal, high-powered nature of the Information Sessions discourages most women from participating in any way.
- The difficulties in obtaining and reading the document also discourage women from being well-informed and thus better able to participate in the process.
- There is almost no information in Volume IV of the EIS about the potential positive and negative impacts oil development will have on the lives of women. This is viewed as a major deficiency by the Provincial Advisory Council on the Status of Women. Although the "Women and Oil" Conference in September may address this deficiency, the information which will be available at the conference should have been incorporated in the EIS.
- A needs assessment of the current social services in the three impact areas should have been done. This is also viewed as a deficiency which must be addressed.
- It is recommended that Mobil put into place an Affirmative Action program, to ensure that interested and qualified women have a fair chance at the available jobs.



ATLANTIC FISHING VESSEL ASSOCIATION

P. O. BOX 991
TELEX NO. 019-22845

DARTMOUTH
CANADA

July 29, 1985

Bonny Hill
Hibernia Environmental
Assessment Panel
345 Duckworth St.
P.O. Box 1505, Station C
St. John's, Nfld.
A1C 5N8

Dear Ms. Hill:

On behalf of the Atlantic Fishing Vessel Association, I would like to reiterate and summarize the gist of our comments expressed at the information meeting held June 19 in St. John's.

The Hibernia development will have a direct impact on the fishing activity of our fleet. We trust that the Panel will demand an impact assessment for all the vessels fishing in the Hibernia area, not just for those vessels based in Newfoundland.

Our specific concerns relate to:

1. Loss of access
2. Abandonment procedures and the final status of the area
3. Liability of the oil companies regarding damage to the environment during or after development and abandonment
4. Cost of displacement of fishing effort in traditional areas of high catch rates
5. The threat to stock viability in the event of damage to installations from severe environmental conditions or human error
6. Blowouts

ATLANTIC FISHING VESSEL ASSOCIATION

-2-

Our overriding concern has to be the long-term protection of the fishing environment with continued and unimpeded access to it.

We plan to attend the general meetings in the fall and would appreciate notification of the dates and places as soon as they are available.

Sincerely,

A handwritten signature in cursive script, reading "Barbara K. Riley". The signature is written in dark ink and is positioned above the printed name.

Barbara K. Riley
Oil & Gas Coordinator

RESPONSE TO HIBERNIA
ENVIRONMENTAL IMPACT STATEMENT

Submitted by:

The Interchurch Commission
on Resource Development

July 31, 1985

Inter-Church Commission

Social Impact of Resource Development

P. O. Box 2097, Station C, St. John's Nfld. A1C 5R6

August 1, 1985

Dr. R. Peters
Mr. P. Paradine
Co-Chairmen
Hibernia Environmental Assessment
Panel
6th Floor, 345 Duckworth Street
P.O. Box 1505
St. John's, Nfld.
A1C 5N8

Dear Sirs:

On behalf of the Inter-Church Commission, and member churches of the Commission - the Anglican, Salvation Army, Roman Catholic, and United Churches -, I am pleased to submit our commentary on the deficiencies in the Hibernia Environmental Impact Statement, as well as observations relevant to these deficiencies. Our submission also includes an appended commentary by the Rev. Peter J. Hamel:

I trust this information will prove helpful to the panel.

Sincerely yours,



Harold Hiscock
for
The Rev. Ralph Billard
Chairman

HH/ec
Encl:

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INTRODUCTION

Public confidence in the Hibernia Project, and an understanding of the major issues associated with this development is fundamental to the success of the Project; public knowledge and support for the Project will optimise the positive impacts and serve to mitigate negative social impacts. In this context a discussion of deficiencies cannot preclude other related factors which contribute to public confidence and understanding. An examination of the terms of reference assigned the Hibernia Environmental Assessment Review Panel, the scope of the review, and the public review process itself, these, together with the methodology employed in the E.I.S., and references to specific deficiencies will constitute our critique.

SCOPE

While the Hibernia E.I.S. generally complies with the intent of the guidelines issued in 1980 and 1981, the proponent's strict delineation of the development site has led to significant information gaps on environmental impacts in two instances.

The first concerns the impacts on coastal waters surrounding the proposed supply base and construction sites, which are also important inshore fishing grounds.

The E.I.S. is aware of this (see maps, pp. 56 and 63 in Vol. 4) but there is no effort to determine what effects site operations would have on either access to grounds, marine safety, or fouling of catches and gear. Consequently, although the information contained in Table 2.3.13 and 2.3.16 of Vol. 4,

shows that there are many area residents engaged in the inshore fishery and fish processing in these two impact areas, there is no data on which to evaluate how this industry would be affected by the Hibernia development. Moreover, since the fisheries compensation plan in place does not cover attributable damage/displacement costs or lost employment to fish plant workers resulting from the former, individuals currently attached to this local industry have no protection against disruptions caused by development activities.

Secondly, both sets of government guidelines (eg. Section 4 and 6 of Part II of the provincial 1981 guidelines and Section 6.2 of the 1980 federal guidelines) requests information on quantity and control measures for emissions, waste/material pollution (including noise) and the effect of these on environmental quality for land based development sites. There is no specific analysis of this given in the E.I.S..

The proponent has argued that detailed investigation of this issue is not feasible until design work for the production system has been completed and specific sites chosen through letting of contracts. They have maintained in the public information sessions that full scale assessments of site impacts would be carried out through application of the Provincial Environmental Assessment Act. This raises a number of questions and concerns.

First, how did the proponent carry out an assessment of physical infrastructure requirements for the rural impact areas without prior knowledge of the nature of solid and water wastes that would have to be handled at sites? Secondly, If this work was based on generalized specifications from other field developments, why wasn't this information made available to the public?

Thirdly, given the fact that the time frame for the Hibernia Project states construction would begin in 1987, while the provincial legislation governing preparation of an E.I.S. requires approximately 260 days to complete (without consideration of time for research or public hearings), one must question whether these matters will be addressed publicly.

It is true that the provincial Department of Development has commissioned site reviews for the Argentia and Come-by-Chance areas but these are not available. To our knowledge, two oil related landsite development applications, the Freshwater Bay and Argentia Development Corporation proposal, are on file with the provincial Department of Environment. An E.I.S. on the Argentia proposal was submitted in 1983, but both it and E.I.S. requirements for the Freshwater supply base proposal may require updating when Hibernia project specifications become available. As with the Hibernia environmental assessment process, public input may again be hampered by time and access to information.

There are other difficulties with the E.I.S. compliance to the issued guidelines. For example, although both sets of guidelines ask for assessments of oil contamination arising from production, storage and distribution of the Hibernia resource, it is not clear from the E.I.S. how much work has been done for the latter two operations. Since the E.I.S. acknowledges that there is little information available on spills from storage facilities (Vol. 1, p. 41) and that the storage vessel planned for the floating production system will entail merging of existing technology, further research and development requirements should be defined. This is also true for any deficiencies in the existing environmental parameters. Moreover, since the assessment of shuttle tanker spills was restricted to the

Hibernia site, it should be expanded to meet the requirements of the provincial guidelines (eg., see Part II, Section 4.B and 4.C).

Similarly, the discussion of abandonment of the Hibernia site (Vol. II, pp. 100 - 101) merely states that procedures will comply with the, as yet unknown, legislation to be adopted for the Atlantic Accord. As in the case of the discussion of land site developments, there is no information on measures required for stabilization of areas or for the ultimate disposal of organic and/or mineral waste materials. With the lessons of past industrial shut-downs and the monstrous problems surrounding toxic waste clean-ups elsewhere in Canada before us, this oversight must be addressed in your consideration of this proposed development.

TERMS OF REFERENCE

Since the National Energy Policy cannot be debated, we cannot determine how Hibernia will relate to other Canadian production and proposed developments. The National Energy Policy will affect decisions on the pace of development for Hibernia and other offshore oil and gas developments. Thus its exclusion from public debate creates difficulties for intervenors assessing: a) the impacts from the production of Hibernia, and b) the impacts of Hibernia in relation to other offshore field developments.

The exclusion of project economics from the public review is even more problematic for intervenors. In one fell swoop, we are prevented from examining the economic viability of Hibernia within a global context, as well as the public investment and returns.

The development plan is to be released in mid-September. As was stated in the information sessions intervenors had hoped to find answers to some of the above questions in this document. However, it is not yet clear if we will have access to it in time to help prepare for the formal briefs. Similar concerns have been raised with respect to the Canada Newfoundland Benefits package.

THE PUBLIC REVIEW PROCESS

The Hibernia Environmental Assessment Review is the first for Canadian Offshore Development Projects and as such maybe a prototype for reviews of future oil developments. It should therefore be carefully evaluated in an effort to improve the process.

The time-frame for effective public participation is unrealistic. The proponent had several years and tax-deductible financial resources (\$8 million +) to produce the E.I.S.. However, intervenors have had very little time and insufficient resources to prepare their positions. The Provincial Government's \$50,000 intervenor funding is too little too late, and it precludes response to E.I.S. deficiencies.

Only three of the panel's technical experts have submitted material. Final reports from all technical experts may not be available until after mid-August, again too little time is given intervenors to review this material.

To date there has been no Federal/Provincial Government response to the content of the E.I.S.. As a consequence, questions revised at the information sessions which could only be properly answered by specific government departments were not adequately addressed. Future reviews should include a means

for direct or indirect government participation.

Referring again to the time-frame, we would like to note that during the summer months, when the fishery and vacations are at a peak, most intervenor organizations depend on voluntary input and are at a disadvantage in co-ordinating their resources during this season.

Several times throughout the information hearings the panel chairman interrupted intervenors in order to allow for wider participation. This is laudible but in several cases the lines of questioning was defused by the chair's ruling.

To foster accountability in the process the panel's final report should be made public. Federal and Provincial Governments should publically respond to the report and indicate how the recommendations will be enacted. This is crucial to the credibility of the review process.

METHODOLOGY

As a preface to the following section of this critique we wish to make some brief comments on the proponent's application of the S.E.I.S. methods outlined at the beginning of Vol. 4. of the E.I.S. (see pp. 4 to 10).

To begin with, the results of this assessment technique are highly contingent upon the factors included (ie. scoped) and the accuracy of the data-base used to constitute these factors. Since the model is interactive, omissions or errors made in any component stage is conducted throughout the chain of logic to the conclusions. The tool is therefore widely recognized (and criticized) as inexact and users generally give findings as correlations of factors - even when referencing past events. These are inherent deficiencies in the process that require us

to carefully examined the quality of the information generated for each stage of the Hibernia S.E.I.S..

We have already considered some of the problems arising from the narrow scoping of the project site and the proponent acknowledges the data gaps that exist within Stage 3 of the process. (eg., lack of information re current supply and demand for community/social services). Similarly, it is noted that uncertainties surrounding the project affect the viability of the manpower projections on direct employment, Canadian/Nfld. content, construction sites, etc. utilized in Stage 4 of the Model. For this reason, we are given two impact scenarios incorporating the two possible production system that treats these impinging variables as non-existent.

This decision to make the identification of project requirements impermeable to change raises immediate challenges to the viability of the results of the exercise. From the public's perspective, the credibility of the data is further hampered by: a) the proponent's failure to provide details on the source of the estimates made on project requirements situated within this province; and b) the proponent's failure to consider within the assessment indirect or induced requirements associated with these two scenarios. Consequently, the projects impacts developed in Stage 5 of the process suffer from information gaps, lack of sensitivity to intervening variables, and the lack of an independent review of the project baseline requirements supplied to researchers for the component studies.

DEFICIENCIES

In our opinion, these 'lack ofs' severely impair the utility and credibility the Hibernia E.I.S.

In conclusion, we point out deficiencies which have already been addressed at the Information Sessions, and will proceed as follows: with a heading; a statement of general concern; and references from the transcripts.

ECONOMICS/INFLATION

While the economics of this proposed development is outside the mandate of the panel it is incumbent upon us to raise the issue. Without a clear understanding of the cost/benefit analysis it becomes very difficult for any community organization to address the total impacts arising in the E.I.S..

Economic implications are far ranging, for example, many of the social and infrastructural impacts will occur during the developmental phase, yet there will be no return on investment until the production phase. Who then will be responsible (financially) should any adverse impacts occur? In addition to community service organizations the business community expressed a need to know more about the project economics before making their own investment decisions.

Reference: Norman, St. John's, Volume II, p. 966, Line 17 - 971
Line 7.

Cag, St. John's, Volume II, p. 948, Line 7.
p. 951, Line 25.

Tooton, St. John's, Volume 8, p. 663, Lines 24 - 30.

EMPLOYMENT/TRAINING

The quality of information regarding employment opportunities and educational programs required by people of this province is at best questionable. The proponent refers to the E.I.S. as a planning document and points out that the employment calculations are based on a number of assumptions. Discussion of these assumptions has raised many questions for community organizations. Examples: Do we need a new course on welding at the Trades School or should the existing course include a petroleum related component, possibly in the form of a work term? Should extensive advertising take place to encourage new entries into vocational education institutions? If the answers to these questions are 'yes' then there is little or no time to get this rolling for this upcoming year. If the answer is 'no', we are still left wondering if some action should immediately take place since there is no mention in the E.I.S. of possible cumulative affect.

Further complications arise because we do not know how long a particular skill will be required for the Hibernia Project, or if there will be a market for it with additional field developments.

With the limited information, far too much speculation is needed at this point to make strong recommendations to either the proponent or to government.

- References: Rahal, Harbour Grace, p. 30.
 Rahal, Harbour Grace, p. 21, lines 25 - 28.
 Rahal, Harbour Grace, p. 30, line 13,
 p. 31, line 13.
 Rahal, Harbour Grace, p. 43, lines 13 - 17.
 Jewer, Harbour Grace, p. 44, lines 13 - 20.
 Rahal, Harbour Grace, p. 46, lines 18 - 24.
 Sherk, Harbour Grace, p. 31, lines 19 - 25.
 Sherk, Harbour Grace, p. 32, lines 25 - 27.
 Able, Marystown, p. 112, lines 24 - 27.
 Rahal, Marystown, p. 119, lines 8 - 14.
 Gardner, Marystown, p. 124, lines 19 - 26.
 Walsh and Sherk, Marystown, p. 130, lines 12 - 20.
 Sherk, Marystown, p. 130, lines 21 - 26.
 Sherk, Marystown, p. 130, line 27,
 p. 131, line 8.
 Walsh and Sherk, Marystown, p. 131, lines 19 - 27.
 Norman, St. John's, Volume 8, p. 666, line 19
 p. 672, line 26.

INFRASTRUCTURE

Some people consider the E.I.S. estimates on population increases in impact areas to be very low. MOBIL admits that any number of variables can change the estimates, and previously documented experiences (ie. North Sea) show a much greater increase in population than was originally anticipated. Yet there are no contingency plans in the E.I.S. for meeting additional community and social service infracture should this pattern be repeated.

Of particular concern to us is the cost of additional infrastructure. What is considered minimal by MOBIL is not necessarily seen by others in that light especially by municipalities who have already invested substantial amounts

of money to improve transportation.

The proponent will accept responsibility for direct impacts and those caused by its contractors, however, it is not stated who decides which impacts fit into what category. This problem was clearly illustrated, for example, in the discussion on speculative migration and induced needs within the general population.

References: Shrimpton, St. John's, Volume II, p. 951, lines 29-958
line 11.
Norman, St. John's, Volume II, p. 966, lines 17 - 971
line 7.
Duff, St. John's, Volume 8, p. 683, line 29
Hodder, St. John's, Volume II, p. 937, lines 2 - 939.
line 10.
MacDonald, Harbour Grace, Volume 1, p. 35, lines 12-23.
Sherk, Harbour Grace, Volume 1, p. 37, line 14
p. 38, line 28.

ENVIRONMENT

There are a couple of deficiencies regarding environmental impacts which we feel must be addressed more fully. Most pronounced is the concentration of studies and information around the Hibernia site to the exclusion of coastal zones. Tankers will enter regular shipping lanes after leaving Hibernia. Surely, it is possible with increased traffic in these lanes for a spill to occur enroute. In the event that this did happen what effect would it have on bird sanctuaries, like those on the Southern Shore and in St. Mary's Bay and what effect would it have on the inshore fishery?

In reference to the chemical wastes at the Hibernia site, It is not clear exactly how harmful production operations will be to organisms within and outside the 5 kilometre zone. Neither do we know if considerations were given to possible interactions between chemical wastes.

Finally, it was not clear if the proponent intends to give details on how the Effects Monitoring Program for Hibernia will take place, or if these details will be made known to the public before the public hearings.

References: Rice, St. John's, Volume 8, p. 717, line 18.
p. 720, line 2.
Hamel, St. John's, Volume II, p. 997, line 20.
p. 1002, line 13.
Baker, St. John's, Volume 8, p. 690, line 12.
p. 695, line 24.
Lee, St. John's, Volume 8, p. 769, line 7.
p. 772, line 3.

FISHERIES

As with the above environmental concerns, specific mention of the fisheries concentrates for the most part around the Hibernia site. On top of that it focuses only on the Newfoundland based offshore fishery. The E.I.S. therefore addresses only part of the commercial costs to the offshore fishing industry. The real concern for the people is what could happen to the fish stocks in the event of an accident. Stock viability on the Grand Banks affects Newfoundland, Canadian and Foreign fleets as well as the inshore fishery in Newfoundland.

One cannot help but feel cheated when the potential problems in the event of a major spill are minimized to eleven Newfoundland trawlers, as opposed to 40 Canadian trawlers, "x" number of foreign trawlers and "x" number of inshore fisherpersons.

Reference: Youden, St. John's, Volume 8, p. 672, line 27 - 677
line 25.

SAFETY/RISK ASSESSMENT

A great concern to us here is the impact definitions given in Volume 3(b) of the E.I.S. for major, moderate, minor and negligible impacts. We question if these definitions are applied to people and if so, we wonder what would constitute a major impact on human lives. Given the examples cited for these categories in the Information Sessions we shudder to think of how many lives would have to be lost to constitute a major impact.

We would be much more confident of the proponents claim that risks are negligible if there was a single regulatory body in place to oversee the design, construction and site placement of this development. A single body may be able to minimize potential for human error that can arise from the plethora of existing responsible agencies.

References: Rice, St. John's, Volume 11, p. 1032, line 4
p. 1038, line 30.

Newhook, St. John's, Volume 11, p. 964, line 22
p. 966, line 14.

Hopkins, St. John's, Volume 8, p. 715, line 4
p. 716, line 30.

See also questions to technical expert from the Association of Professional Engineers of Newfoundland.

SOCIAL SERVICES

Because of the failures of the E.I.S. to quantify social service needs, major concerns were raised throughout the information sessions on cumulative effect, responsibility for provisions of services, and the adequacy of monitoring systems. See references for infrastructure as well as those listed below.

References: Rowe, St. John's, Volume II, p. 917, line 28
p. 924, line 22.
Hickey, St. John's, Volume 8, p. 761, Line 1
p. 764, Line 18
Hedderson, St. John's, Volume II, p. 983, line 13
p. 992, line 16.
Pizarawski, St. John's, Volume II, p. 1004, line 24
p. 1008, line 24.
Rowe, St. John's, Volume II, p. 1010, line 1
p. 1011, line 7
Norman, St. John's, Volume II, p. 1058, line 3
p. 1062, line 25.

PHASE OUT

Finally, participants also expressed concerns about the long term benefits of this development proposal. In particular they wished to know what specific plans the proponent has for phase out of the project and abandonment of site. As well, they pointed the need to plan for the residual unemployment created during completion of the construction and production phases. This underlines the need for public debate on use of project revenues.

References: Robinson, St. John's , Volume II, p. 975 - 976, line 11.
Hodder, St. John's, Volume II, p. 942, line 3
p. 946, line 2.

COMMENTS ON THE TERMS OF REFERENCE, PANEL PROCESS, AND
IDENTIFICATION OF SOME ADDITIONAL INFORMATION REQUIRED TO
EVALUATE THE POTENTIAL ENVIRONMENTAL AND SOCIO-ECONOMIC
IMPACTS CONTAINED IN THE HIBERNIA ENVIRONMENTAL IMPACT
STATEMENT

An appendix to the Interchurch Commission on Social Impact
and Resource Development Deficiency Statement to the Hibernia
Environmental Assessment Panel

July 29, 1985

by

Peter J. Hamel

The author is the Consultant on National Affairs for the Anglican Church of Canada. He has participated in a number of environmental assessment hearings over the past eight years. The Interchurch Commission invited him to work with them on the Hibernia Environmental Assessment hearings. Peter attended the Information Session in St. John's on June 26, 1985 and was subsequently asked to supply comments on marine birds, the need for a Coastal Zone Management Plan, and his experience with the West Coast Offshore Exploration Environmental Assessment review process. Also included are some notes on the Terms of Reference for the Hibernia Environmental Assessment Review Panel by Dr. Robert Gibson from the University of Waterloo, Ontario.

TERMS OF REFERENCE

The churches are deeply concerned that only \$50 thousand is available to intervenors. Mobil spent over \$8 million to produce the Hibernia EIS. The Panel itself has a budget of \$500,000. The Primate of the Anglican Church of Canada, Archbishop E.W. Scott, has stated on several occasions that adequate intervenor funding is essential to informed public participation in the assessment of major development projects. It is particularly important for those citizens directly affected who have least access to corporate and government levels of decision making. Mobil is the expert on Petroleum, but local government and people are the experts on local society.

Through several hearing processes over the past decade Canadians have demonstrated their competence in addressing environment and socio-economic concerns related to industrial projects in this country. In its Final Report on Beaufort Sea Hydrocarbon Projection and Transportation the Environmental Assessment Panel (July 1984; p.7) stated:

"...the Panel concludes that the review process was materially assisted and that intervenor funding enhanced the quality and substance of interventions from northern residents whose interests would be most directly affected if the development were to go ahead."

The Panel recommended:

"that intervenor funding be made available for all future EARP reviews, and that funding be restricted to those participants who would be significantly affected by the proposal under review."

A total of \$1,004,691 over a three year period was provided to 32 different intervenors.

If the public hearing process is to be taken seriously, and not merely a convenient vehicle to rubber stamp Mobil's development proposal, local people need to be given the financial resources necessary to conduct their own independent assessment of the Hibernia proposal. Mr. Abel made it quite clear at the Information session in St. John's on June 26th that Mobil is giving only their point of view. He said: "...I cannot look at it from the way participants do...I guess I cannot view it from the other side because I see it from our side, and I am not in a position to do that."

The time frame is totally unreasonable to allow for effective public participation. Mobil took several years to prepare its EIS. It was made public in mid-May and yet the company

will not be releasing its development alternative until August 15th. Mobil's Development Plan will be submitted to government in mid-September and may not be released to the public. We have little analysis of the project proposal other than Mobil's. The public has not seen assessment documents from either the federal or provincial governments. That was not the case with the West Coast Offshore hearings.

A year before the Panel was convened in July 1984, the B.C. Ministry of Environment produced a preliminary environmental assessment. It was 334 pages in length and identified and evaluated the environmental implications of offshore hydrocarbon exploration and development for B.C. In January, 1984, COGLA and the B.C. Ministry of Energy, Mines and Resources published a Technical Evaluation of the IEEs for Offshore Petroleum Exploration.

Following the community information meetings and deficiency statements from the public and governments the Panel issued a 34-page document Requirements For Additional Information on December 7, 1984. Government agencies and Chevron were given until February 20, 1985 to answer the questions.

The public hearings were scheduled for early June 1985, but because intervenors found the time frame impossible to meet, they appealed to the Panel for a postponement until September - October, 1985. The Panel responded positively to this request and wrote to the provincial and federal Environment Ministers asking for a postponement. In their letter, the Panel recognized the fact that without intervenor funding, the public needed more time to prepare effective testimony for the public hearings. The Ministers responded positively and granted a postponement. This means the public participants will have over 6 months to prepare their submissions for the public hearings.

The local people in Newfoundland should also be given the same consideration in preparing their submissions. Convening the public hearings for September - October is quite unreasonable. You have a real opportunity to include local communities and the concerned public in the planning process. It is crucial that residents of the coastal communities be given time and the means to become involved in their own destiny.

NOTES ON THE TERMS OF REFERENCE FOR THE HIBERNIA
ENVIRONMENTAL ASSESSMENT REVIEW PANEL
Robert Gibson

1. The most dramatic limitation on the assessment exercise is that the question of "need" or overall desirability of the project in some form has been decided prior to the beginning of the assessment process. In the words of the Hon. William Marshall, "both governments are committed to seeing the Hibernia oil field developed without delay." The issue facing the Panel is, therefore, not whether but how.
2. The Panel is empowered to examine alternative development proposals. However, it seems to be required to limit this examination to the alternatives "contained in the proponent's Environmental Impact Statement". It is at least possible that these alternatives are not comprehensive of the range of alternatives that ought to be considered in the public interest. Alternative kinds and locations of facilities (onshore and offshore) will no doubt be considered. But given the apparent commitment to "development without delay", consideration of alternative timing and scales of operations (especially delayed or extended timing and smaller scale options) is likely to be discouraged if not prohibited.
3. Consideration of alternatives of all kinds, and especially consideration of timing and scale alternatives will be constrained by the direction to the Panel not to examine questions of project economics. In most cases of renewable resource exploitation projects involving very large capital and labour/skilled employment investments over a relatively short period, smaller scale and extended timing options offer major benefits in the enhancement of socio-economic opportunities and avoidance of boom-bust effects. The usual arguments against these options are based almost exclusively on project economics.
4. Consideration of alternatives and especially evaluation of potential environmental impacts and mitigation needs will also be severely constrained if the direction to the Panel not to consider the management regime is interpreted to preclude examination of the adequacy of existing regulations, supervision, monitoring and enforcement capacity.

5. The terms of reference do not mention intervenor funding. In the absence of such funding an equitable and adequately well informed assessment review is probably impossible.

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27 June 1985

COASTAL ZONE MANAGEMENT

One of the basic dilemmas facing the Panel is: How can you decide the terms and conditions under which development and production might proceed in a safe and environmentally responsible manner when there is no coastal management plan in place?

An important first step has been made with the publication in 1984 of the Southeastern Newfoundland Marine Resources Literature Review. Much work, however, remains to be done before legislation is in place. A Shore Zone Management Program remains to be established as well as one dealing with the offshore area.

In the United States, Congress passed the Coastal Zone Management act in 1972. By 1976, 33 of the 34 eligible States and territories had received program development grants. The California Coastal Zone Management Act recognizes that "protecting California's coast is essential for the State's long-term economic well-being. It recognizes the fact that "protection of coastal resources is essential to a sound economic future for California". Such an act in this province would also contribute to a sound economic future for Newfoundland. It would seek to protect the vital ocean fishery, coastal water quality, and marine wildlife resources.

J.D. House (1984) states that to date, the governments' action regarding coastal zone management has been "reactive and development-oriented". They have reacted to "resource-related developments rather than a comprehensive strategy for the coastal zone." The environmental impact assessment process is also development-oriented in a project-specific way. The developer does the assessment. House points out the benefits from more community involvement:

1. More direct government and affected community involvement would increase their learning and experience. In Scotland, initial assessments by local authorities were an important instrument in the planning process;
2. Studies conducted by communities could be financed by the proponents. Rather than Mobil playing the "big brother" role, local communities could actively investigate concerns for themselves.

There is no integrated policy to manage and protect the coastal environment of Newfoundland. Government agencies have reviewed and evaluated resource development applications on their individual merit rather than evaluating the cumulative effect of permits granted. If this pattern continues, says the Global 2000 Report to the U.S. President (1980) the degradation of coastal zone habitats will bring about changes in fish species composition and the quantity of the fisheries catch.

As I recommended at the Information Session on June 26th, the Panel should study the California Coastal Management Plan (1978) and the California Coastal Act (1976). The Act establishes the California Coastal Commission as the oversight body in coastal resource management for California. Any proposed action that directly affects the coastal zone must be consistent with, to the maximum extent practicable, the California Coastal Management Plan.

The policies of the Coastal Act and the California Coastal Management Program address the following concerns: public access, recreation, marine environment, land resources (including environmentally sensitive habitats and agriculture), residential development, energy facilities siting, industrial development, and cumulative impact assessment from all projects.

A management strategy should be developed for the coastal zone of Newfoundland and Labrador.

MARINE BIRDS

This section discusses the methodology used in Mobil's Hibernia Environmental Impact Statement (EIS) to survey the marine bird populations over the offshore waters of the Grand Banks and the inshore waters surrounding the Avalon Peninsula.

The author has reviewed the EIS and the Grand Banks Wildlife Study Final Report (GBWS) Volume 1. Volume 2 has been ordered but not received (July 29).

The Guidelines for the Preparation of an EIS published by the Federal Government (1980) and the Government of Newfoundland and Labrador (1981) both state that Mobil should describe the "seasonal distribution, movements and abundance of marine bird populations in nearshore and offshore waters."

The methodologies used and the limited time frame were insufficient to provide adequate baseline information to comply with the guidelines and identify areas of potential impact. This is vital to the development of a project design that safeguards the avian community.

The GBWS (1-1) states that the existing information on "...abundance, migration, nesting and over-wintering patterns" of the seabirds "was inadequate for assessing the possible impact of hydrocarbon developments upon these populations." Mobil conducted over a one year period (1980 - 1981) aerial and shipboard surveys to fill in the data gaps with the existing information collected by the Canadian Wildlife Service between 1969 - 1983. Clapp, Jacobs and Banks (1983, p.28) agree with Drury's comments (1980) on surveys done in Alaska and New England that "one should not draw conclusions based on data gathered in the course of scattered surveys made over a few years, no matter how precise and thorough the counting of each sample."

Robertson, Campbell and Kaiser (1983) in their atlas of marine birds on the West Coast of Canada point out that "error is an important feature of aerial surveys..." (p.3). Gould, Forsell and Lensink (1982) in their impressive study on the pelagic distribution and abundance of seabirds off Alaska state (p.iv) that in their surveys conducted from ships and aircraft "we perhaps see most gulls, jaegers and kittiwakes, nearly as many shearwaters...a smaller proportion of large alcids, and fewer still of small alcids, storm-petrels, and phalaropes." The EIS (IIIa, p.200) admits that alcids "are often difficult to identify during surveys...and consequently their distribution can be described only in a general way."

The Mobil aerial surveys used two observers with a transect width of 400m. The Alaskan survey, containing two million observations, used three observers and a transect width of 100m. because "the rapidity with which specific areas are covered...seriously reduces the observer's time to detect individual birds." This plus a reduced observation zone decreases the chances of detecting uncommon species and reduces the observer's ability to identify individual birds.

The EIS (IIIa, p.192) states that the aerial and shipboard surveys "provided a general overview of marine-related bird distributions on the Grand Banks and in the coastal waters of Avalon Peninsula." The study, however, "did not assess the relative use of portions of the study area by birds, or estimate the numbers of individuals of birds present in the study area." Such an assessment is vital to our ability to conserve marine birds.

At the Information Session in St. John's on June 26th, the author asked Dr. Cal Ross if particular areas within the Hibernia field had been identified as particularly important for seabirds, and whether those sites were being protected from development. Dr. Ross replied that he could "think of no protected mechanism to do that." Such mechanisms have been instituted by the California Coastal Commission and the Coastal Zone management legislation for California and should be implemented for this proposal.

The EIS (IIIa, p.192) further admits that because the data was collected "over the course of only one year, the distributions described are not necessarily typical of all years." Furthermore, "despite the 15-year data base, total coverage is incomplete for certain portions of the study area." It is vital that those data gaps be identified and evaluated before the development is allowed to proceed. It is also important that the study address impacts on adjacent sites that have special importance to marine birds.

There appear to be some important omissions in the literature review. The Grand Banks Wildlife Study (Volume 1: 3-1) quotes 1979 sources as saying that "imprecise estimates and fragmentary records exist for the eastern North Pacific...but include at least 10 million breeding individuals of several species from Alaska south to the State of Washington." SOWLS, HATCH and LENSINK (1978) in their impressive Catalogue of Alaskan Seabird Colonies estimate the Alaskan population of breeding seabirds to be over 40 million!

The EIS Volume IIIa also does not cite Gould, Forsell and Lensink's magnificent Alaskan study (1982). Some scientists consider it the state of the art in survey work. Also not cited is the 1982-3 three-volume work produced by the U.S.

Fish and Wildlife Service on the marine birds of the southeastern U.S. and Gulf of Mexico. This 1981-page study was produced "to assess the possible effects of offshore oil development on populations of marine birds in the southeast."

The EIS Volume 1 Summary (p.42) states that "seabirds are the most vulnerable species to damage from oil spills." Later

(p.45) it is admitted that "the same oceanographic forces which tend to concentrate plankton and the seabirds feeding on them, also concentrate floating oil. For these reasons, in the event of a major oil spill, it is possible that large numbers of seabirds could come into contact with the oil slick."

Seabirds are already under heavy pressure from harvesting for food, starvation through a serious depletion of the capelin stocks, and the establishment of a drift-net fishery. Poisonous chemical wastes and previous oil spills are also seriously impacting seabird populations. The threat of possible oil spills in new offshore oil development makes it imperative that adequate baseline data be available on marine birds before a responsible evaluation of the Hibernia project can be made by the Panel.

The Southeastern Newfoundland Marine Resources Literature Review (1984) points out that "seabirds represent the biological resource that is both under the most intense population pressure at present, and at the same time is most sensitive to surface (oil) pollution" (p.168). It recommends that shorebased observations "should be extended to take in the remaining northern bays in the study area. Observations should be made at some stations over several years to describe annual variation in results." (p.161)

It also pointed out that "there seems to be nothing in the literature discussing shorebirds in the study area." Nine species are mentioned in the EIS Table 3.2-23, but only the Phalaropes receive limited attention in the discussion section. The GBWS gives only 4 pages to these birds.

A number of problems have been identified. Aerial surveys are prone to error. The shipboard and aerial surveys only covered one year and shipboard surveys were not conducted in October, December or February. The variation in bird numbers from one transect to the next, even within similar areas and dates, can be very high and reflects the high mobility of marine birds in all months of the year.

West coast ornithologists have stated (1983) that:

"Present information is insufficient to delineate with certainty where marine bird numbers will be most at hazard from oil spillage on the coast (B.C.). One can only generalize where, which species and what numbers will be threatened by oil."

They recommend that:

"At least two years of surveys conducted on a monthly basis along the whole coastline as well as in adjacent waters of the Shelf are necessary to establish minimal baseline information for judgment on terminal locations and offshore drilling operations. We therefore fervently hope that such decisions will be delayed until at least that information has been gathered."

(Distribution and Densities of Marine Birds on the Canadian West Coast p.71)

The author believes the same situation and recommendation apply to Newfoundland.

Atmospheric Emissions

EIS Volume IIIb (p.145) states that the impact on seabirds from atmospheric emissions is rated as "0". At the Information Session in St. John's on June 26, 1985, Dr. Cal Ross stated (p.1002) that gas flaring has not been substantiated as a problem for seabirds in the North Sea. Chevron in its IEE for the West Coast Offshore hearings states there is a controversy over the number of bird kills due to gas flares in the North Sea.

Sage (1979) brought this controversy to the public's attention when he documented what he felt to be a coverup by the companies involved in offshore exploration. His claims were challenged by Bourne (1979) and Jones (1980). This only points out the fact that there is disagreement about actual or imagined mortality caused by gas flares at offshore rigs.

Large and/or continuous losses have not been recorded. The crux of this issue may simply be that these losses were not recorded because they were not thought to be significant, although they may have occurred.

The Grand Banks are an important seabird feeding area throughout the year. One cannot dismiss as insignificant the possibility of large or continuous losses which may occur in the production area.

Rig Lighting

In Table C-4 (EIS Volume IIIb, p.147) seabirds are given an impact rating of "0" regarding flaring, illumination and beacons. I could find little discussion of this concern. It is well known and documented that bird kills are frequent at large, tall, lighted structures, on dark, wet, overcast

nights, particularly during the spring and fall migrations. What is not known is what does disorient migrating birds and cause them to be attracted to these lighted structures during periods of fog, rain, or drizzle in nighttime situations. Petrels and Alcids are attracted to artificial lighting. Unlike land towers, in which the carcasses pile up on the ground, and can be readily documented, collisions with oil platforms will pass largely unnoticed since the dead and injured birds will fall into the sea and be carried away. Bird-platform collisions are a serious problem that must be addressed by the Panel.

IMPACTS FROM OIL SPILLS

The EIS (IIIb, p.108) admits that "in many instances, no mitigation may be possible once oil is spilled, therefore the residual impact of some accidental spills remains potentially major."

A Norwegian marine scientist, Otto Grahl-Nielson, has stated that within up to 10 kilometres of drilling rigs in the North Sea, he found substantial pollution of water, marine life and sediment on the ocean floor. Conditions in the North Sea are similar to those off Newfoundland, he said, and similar pollution can be expected as exploratory and production drilling continue off Canada's east coast (Globe & Mail; October 20, 1981). The EIS IIIb (p.99) states that "in the North Sea, significant sediment contamination has been restricted to within the 500m. no-fishing zone around production platforms."

The California Coastal Commission (CCC) (1983) is concerned with the long-term sublethal effects of drilling muds and formation water discharges. The Technical Evaluation of the IEEs for Offshore Petroleum Exploration (1984) in British Columbia also identified this issue as a problem area. The report stated that better information was required on the "possible indirect effects of drilling waste discharges on marine birds and mammals." Recent research done by Exxon demonstrated that toxic components of these discharges were transported for distances up to 5 - 6 miles. Other Exxon research indicated that the greatest concentrations of discharged drilling muds occurred 2.5 miles from the rig.

The California Coastal Act requires protection of the marine environment from any spilling of crude oil, gas petroleum products, or other hazardous substances. It further requires that "effective containment and cleanup facilities and procedures" must be provided for spills that occur. The CCC interprets the word "effective" to mean that "spill containment and recovery equipment must have the ability to keep spills off the coastline."

The EIS for California Lease Sale 73 (1973) stated that due to the great quantities of oil carried by tankers "...the risk of catastrophic spill and environmental disaster are much greater for tankers than pipeline..." and that "Devastation of a population (of marine mammals) is much more likely from a tanker spill." The CCC also agrees that the onshore pipeline transportation of crude is far superior to transportation by tanker. This assessment is based on the fact that "Spills that do occur from onshore operations are usually less damaging than spills from tanker operations in the marine environment."

The CCC also points out that a disabled oil carrying vessel has the ability to spread oil more rapidly than a wind and current driven slick.

Oil spills are considered to be one of the greatest impacting agents to marine life from offshore hydrocarbon development. Effective containment and cleanup facilities must be in place to keep spills off the coastline especially from such highly sensitive areas as the Witless Bay seabird colonies.



BOX 5132, ST. JOHN'S, NFLD. A1C 5V5

THE HIBERNIA ENVIRONMENTAL IMPACT STATEMENT

DEFICIENCIES AND OMISSIONS

Prepared by:

The Wilderness Society of Newfoundland and Labrador

31 July 1985

HIERNIA ENVIRONMENTAL IMPACT STATEMENT - DEFICIENCIES AND OMISSIONS

Prepared by the Wilderness Society of Newfoundland and Labrador

Several members of the wilderness Society of Newfoundland and Labrador have reviewed Volumes IIIA and IIIE of the Hiernia Environmental Impact Statement. We have found several areas where information important for evaluating the environmental impact of the project is absent, too superficial, contradictory, or otherwise unsatisfactory. We will point out these areas in this submission, and request that the panel ask the proponents to provide missing information or clarify currently inadequate portions of the Environmental Impact Statement (hence EIS). Our concerns are presented in six general subsections. The first five are specific themes and the sixth serves as a miscellaneous category. In a submission to be made in September 1985, we will point out a number of additional areas where we feel factual information provided in the EIS can be disputed, or where conclusions drawn from the data bases and models can be challenged.

I: INFORMATION WHICH IS ABSENT

A: The EIS does not address any potential consequences of the transport of hydrocarbons from the Hibernia site, nor accidents which might occur during transport. Rather, the EIS states "shuttle tankers will enter regular shipping lanes very soon after leaving the Hibernia facilities; only a potential tanker spill within the immediate Hibernia area is discussed in detail in the EIS." (IIIB, pg 8). We raised this point during the public information session, and were told that because Hibernia oil would be replacing oil currently shipped to Newfoundland from other sources, there would be no net change in traffic of oil tankers in the study area (proponents definition, Fig 1.2-1).

We dispute that assertion, as the proponents asserted that Hibernia would be providing 10% of Canada's oil requirements, once in production. We doubt if Newfoundland currently uses 10% of Canada's oil, so the traffic would be greater than replacement. Furthermore, the routes currently used by tankers may not cross the heart of the Grand Banks, as shuttle tankers from Hibernia would. We have a very specific request here: the EIS should contain both calculations of the number of "barrel-days" of hydrocarbons currently moved through the study area (a 10,000 barrel tanker in the study area for 3 days of steaming would be 30,000 barrel-days), and the number of barrel days of hydrocarbons moved across the study area when Hibernia is in full production. If Hibernia leads to a substantial increase in transport of hydrocarbons, then a full assessment of the transport component of the project is also necessary. The waters of the Grand Banks are notoriously treacherous for much of the year, and loaded tankers are sluggish.

Realistic probabilities of accidents must be given, as well as consequences of those accidents. Clearly the major conclusion that spills would probably be carried far from land would require reassessment, if spills or tanker accidents away from the Hibernia site itself must be considered. We think they must be considered.

Er We are provided with no useful information on how effects monitoring will be carried out. A study by the proponents has documented how difficult it is to conduct effective, sensitive monitoring of the effects of the project on the environment (Section 7.3.1.3). Yet we are given but two pages on their monitoring program (Sections 7.3.2 and 7.3.3); only two paragraphs on Study Design and Methods. We also raised this concern at the Public Information Sessions, and were told more detail would be inappropriate, because studies were underway which the proponents hoped would lead to improved design of monitoring studies.

Although we are glad such studies are being conducted, we ask for more information here, nonetheless. We feel an effective monitoring program is essential for avoiding possibly unforeseen undesirable consequences of the project, by detecting such effects early, when their sources can be eliminated. We agree that it is premature to ask for detailed study designs, but any responsible proponent ought to be able to provide the following information:

1) Exactly, what properties (are desired in the species and components of the physical environment) be monitored?

2) What is the minimum sensitivity required for the assessments of responses of the species and physical attributes to the project?

3) How will effects monitoring programs be kept completely independent of other aspects of the project, in the sense that the monitors will be able to measure whatever they wish, wherever they wish, and that no pressure can be placed on them (from any interest group) to report or suppress any results.

4) What mechanisms will assure that the stud. designs, and later the results of effects monitoring will be provided to the public, and interested members of the scientific community, promptly, for comment and critical review, and that these comments and reviews will be responded to in meaningful ways?

Comprehensive responses to those four concerns are appropriate for inclusion in the EIS. Once they are provided, the public will have some grounds to evaluate how acceptable a monitoring program which meets all those standards would be. The proponent would then be free to use the results of ongoing research to design a monitoring program meeting the standards agreed to, and reviewed in the mechanisms outlined in response to comment 4.

C: The proponent agrees that residual impacts of additive, repetitive and chronic impacts of the Hibernia project is an issue that remains unresolved. We are assured the proponent "is fully aware of this concern, and will take it into account in their long-term environmental planning" (EISb, pg 109). We interpret this to mean they don't know exactly what to expect, but will be watching developments closely. This is the first hydrocarbon production on the Grand Banks, and perhaps this is the best we can expect. Nonetheless, we are given no information on HOW the concerns will be taken into account, or HOW concerned groups and individuals in both the public and appropriate government agencies

will be meaningfully involved in such flexible environmental planning. Again, it is appropriate to have the proponent describe the mechanisms which will allow such flexible environmental planning, and exactly what roles the public and government will play in the mechanisms. Then, even if no one knows exactly what to expect, we can evaluate how well informed, interested parties will be about the developments of concern, and how meaningfully they can participate in planning responses to problems which arise.

3: Use of commercial waste disposal companies for disposal of some project wastes is mentioned (4.3.1), and then passed over. We would like assurance that no aspect of the project would lead to production of environmentally deleterious chemicals or other types of wastes, which would be simply passed on to commercial waste disposal companies for local disposal. Newfoundland has few facilities for the disposal of hazardous wastes. We have serious concerns about such wastes being dumped somewhere on the island, possibly to present environmental problems in the future. If any aspect of the Hibernia development, shore or sea based, will involve the use of potentially hazardous chemicals, we would like them itemized, and their ultimate fates listed. Robin Hood Bay may not be the place for used oil and other chemicals.

II: MEANS, RATHER THAN VARIANCES OR DISTRIBUTIONS, OF ENVIRONMENTAL ATTRIBUTES ARE EVALUATED.

This is a frequent problem with the EIS. We are concerned about it because quite possibly an average condition will be readily accommodated by the project design, but an extreme condition is both likely to occur, and is not within the tolerance of the project design. The "worst-case" concept when engineering for the physical environment is a well-established practice. The variance intrinsic in the biological environment requires that a similar concept be fundamental to engineering for the biological environment as well. The proponent is aware of this, and addresses the localized sensitivity of seabirds during their breeding season. However, our point is that the concept applies to a large portion (possibly all) of the ecosystem. We will list just a few compelling examples, but request the proponent to reevaluate the entire treatment of marine life with attention to the intrinsic variance of these populations, rather than the "average" of the population.

On pg 181 the EIS discusses sensitivity of plankton to possible hydrocarbons. They agree data are spotty, but conclude that "the depth at which characteristic groups of organisms normally reside is sufficiently well known". This statement is accompanied by 3.2-3, showing vertical distribution of plankton in the water column. Many plankton show vertical migration. Hence, even if the depth at which they "normally reside" were well known, for a small part of each day such taxa might be at the surface and vulnerable to contamination. The AVERAGE depth is not the crucial factor; rather there is one point in the distribution which renders

the entire population potentially vulnerable. The pattern of considering the average rather than the entire distribution persists throughout the few quantitative tables in IIIA. Moreover, Appendix B lists almost exclusively means rather than ranges or variances. We feel this is inappropriate, and particularly unfortunate given the often huge ranges seen when such data are provided (ex. 3.2-10, B-1).

Just as the average, rather than the distribution constitutes much of the data considered in the EIS, the typical, rather than the rare and unusual constitutes much of the discussion of the biota. This is particularly apparent in discussion of the zooplankton and benthos (3.2.4 and 3.2.5). We are aware of the limitations on data available. Nonetheless, we point out the discrepancy in standards used in terrestrial projects and the one applied here. In a terrestrial project, rare species and rare habitats are of exceptional interest. Their presence can influence siting and forms of development greatly. Whooping cranes, pine martins, and peregrine falcons are given more consideration than starlings, voles, and cowbirds. In the Hibernia EIS usually only the extremely common taxa are discussed. We would like to know the rare species and the rare habitats present in the study area, and we would like to see explicit acknowledgement that such species and habitats, if documented, would receive the same special consideration that rare species and rare habitats do on land.

We also note that the variance in physical attributes often receives little attention. The variance in trace element and background hydrocarbon concentrations are very large (3.2.2.2 and 3.2.2.3), and of great significance to designing of monitoring studies. Data on weather is presented without variances (3.1-4),

and the apparent increase in variance in iceberg numbers in the past decades is passed without comment. In all of these cases we feel the proponent is not tackling the really important problem of determining and designing to a realistic environmental or biological worst case. Rather they are addressing the much less problematic average case, and underestimating possible difficulties. We would like to see more attention to presenting variance, and designing for biological "worst cases", throughout the EIS.

III: THE DATA BASE COMES FROM SAMPLING WHICH IS INADEQUATE IN SPACE AND TIME

We will not flog this point, although it is probably the most fundamental problem in the EIS. The proponent cannot instantly produce more valid data. Nonetheless, for meaningful estimations of project impacts finer spatial resolution and greatly temporal scale are both essential. We ask that the panel keep this concern prominent in their consideration of the project. Any conclusions of the proponent are tentative. Every means should be used to assure that the data base on ALL levels of the ecosystem are continually expanded, and integrated with existing knowledge about the Grand Banks ecosystem. As a specific request, the panel should require a mechanism be established to insure that coordinated data collection and integration proceed, and that regular forums be provided where scientists from government, industry and academia, and concerned members of the public can all review the data, inferences drawn from the data, and modifications of operations related to the project which respond to the ever growing knowledge base.

We will illustrate a few cases which document the limitations of the data base. Many others exist, which can be itemized for the panel if desired. However, this is the sort of job we expect would be most appropriate for the experts retained by the panel for such purposes.

As pointed out in the prior section, the spatial sampling is too coarse to identify *ANY* areas of unique value on the Grand Banks. It is possible that there are no such areas on the Grand Banks, but it is also possible that many unique areas exist, areas of special biological value, but the sampling regime could not detect them. Both sections 3.2.4.2 and 3.2.5.2 reflect views painted with a large brush, where only the broadest characteristics can be seen. Even the biologically important fronts apparently don't change from season to season (3.2-1, 3.2-2). Also section 4.1.3 states that there are two important zones with regard to the potential impacts of the project. Almost nothing in volume IIIA is of any use assessing unique sensitivity of these zones compared to other areas of the Grand Banks. We are left with nothing we can say about anything except major sections of the Grand Banks. As we mentioned at the Public Information Session, were this to be proposed for a development on land, the EIS would be rejected out of hand. If the proponent can't do better now, we need assurances the spatial resolution of the data base will be improved prior to commencement of major development, particularly in the zones delineated by the proponent, and assurances that the development details will be reevaluated in public forums when additional spatial data are available.

The data base on all but fish comes nearly exclusively from a single year on the Grand Banks. We are aware of the cost of research at sea, and the problems presented by those costs. Nonetheless, we would like much more explicit acknowledgement of the limitations presented by basing findings on single year of data. We have read the consultants reports of some of this research, and nearly every statement is qualified carefully. These reservations about the broad applicability of the research do not transfer prominently to the EIS itself. It is particularly unfortunate that the "Year-On-The-Grand-Banks" appears to have been an atypical year; at an atypical low point in the cycle of capelin abundance. Evaluation of noncommercial fish, animal feeding patterns, and community structure all emphasise sand lance as a key to the Grand Banks ecosystem. Those patterns and processes, and seabird and marine mammal distributions all may have been atypical in that year, because of the scarcity of the common fodder fish, capelin. When there is only a single year of data, generality is always questionable. When that year is even more atypical than usual, the basis for generalization is even more dubious. As with problems with spatial resolution, we would like a mechanism to insure collection, integration, and public discussion of additional data.

IV: SENSITIVITY OF MODELS AND/OR ACCURACY OF PARAMETERS ARE GLOSSED OVER

In several places models are used to make predictions about the Grand Banks ecosystem or physical environment. In other places values for ecological parameters are estimated from the data available, then used in making projections. When models are used, often no mention is made of how sensitive (or insensitive) the model may be. For example on page 51 (IIIA) two wind driven current models are mentioned. We are warned "both have shortcomings", although one was preferred. We are not told what those shortcomings are, or how serious the shortcomings are, in terms of compromising model applicability. For most other models we are not even given the warning that there are shortcomings, let alone what those shortcomings are. We would like the following information to be presented in a systematic and easily assimilated way for every model used in the EIS:

- 1) The explicit and implicit assumptions of the model.
- 2) How sensitive the model is to deviations from each assumption or change in initial condition.
- 3) The range of possible predictions of the model consistent with the assumptions of the model (not just the most favourable, or typical prediction).

Some of the sections on physical models include a treatment of model sensitivity. Slick-track projections, for example, lead to figures with many possible tracks, depending on model variables. Whenever models are used, we would like to see similar figures, with the range of possible outcomes clearly displayed.

On page 220, the production of bacteria on the Grand Banks is given as 19 gCarbon/yr, and told that estimate is simply 10% of primary production. Such a source for parameter estimates hardly inspires confidence that studies using the values will be sensitive and accurate. Many other parameters are presented in the EIS (ex. 3.2-32). We would like to know how the parameter estimates were arrived at, and what confidence can be placed in the specific values. We aren't asking for the consultant's reports to be duplicated in total; merely to be told a value was measured directly, with confidence interval x to y, or was measured indirectly, with confidence interval v to w; or was simply estimated from other parameter values (those with confidence intervals t to u) with confidence interval r to s. Then if those parameters are used in any calculations in the EIS, the range of possible answers should be presented, as well as the typical or average case.

V: INCONSISTENCIES BETWEEN SECTIONS OF THE EIS

Quite commonly in the EIS a point is flagged as important in one place, but elsewhere the point is completely ignored. This gives the entire document an appearance of being prepared piecemeal, rather than carefully thought out and organized. Again, this does not inspire confidence that the proponent gives the environment high priority. More relevant in the context of this submission, we are left unsure of which processes or structures are the ones the proponent really feels are the significant ones, and the ones which will determine aspects of the development. Our list of examples will not be exhaustive, but will illustrate our concern

clearly. We suggest the panel use the expertise at its disposal to identify all such inconsistencies. Then the proponent should be requested to revise the EIS making the document internally consistent and the points of significance unambiguous.

For example, in Section 3.2.9 the EIS states that bacteria may play a unique and vital role in the Grand Banks ecosystem. This interesting and important idea is almost completely ignored in all of volume IIIB. Impacts of the project on bacteria, either benthic or in the water column, are almost never mentioned, nor are bacteria suggested as an ecosystem component to be monitored or impacted by the project. One of the few conclusions from volume IIIA specific to the Grand Banks is ignored in volume IIIB.

Volume IIIB does start with a clear and useful summary of attributes of species which are important in assessing impacts (Table 4.1-1). In Volume IIIA, and the related appendices, the type of information suggested as important in that table are missing for almost all species. Instead we have to assume that the sensitivity index in Appendix B has captured all of the aspects of Table 4.1-1 in some accurate but wholly unspecified way. A chance to structure all of volume IIIA around the information identified as most important in table 4.1-1 has been missed.

Many properties of the Hibernia development are mentioned in various places in the EIS, but not addressed in the impact assessments or monitoring proposals themselves. For example the site may be a heat source in the area, serving to concentrate species and individuals in the immediate vicinity of the project (4.2.1.5). Production waters will also be more saline, and therefore heavier, so they may sink and impact benthos. Such problems are not included in the evaluation of project impacts.

Although we did not read the EIS with a critical eye to each data value and statement, a number of factual inconsistencies were noted. Volume IIIA, page 189 speculates that the Baccalieu colony of storm petrels is "probably largest in the world", yet Table 3.2-24 places 70,000 at Baccalieu and 260,000 at the 3 Witless Bay Islands (only 2 of which support large numbers of storm petrels). The statement that someone "estimated average annual benthic production in the Grand Banks to be 536 kg/m²" (IIIA; pg. 143) caused some raised eyebrows as well.

Unfulfilled promissory notes also abound in the EIS. Volume IIIA, 1.1 promises that Section 7.3 "describes ongoing physical and operational monitoring as well as monitoring programs which may be carried out." Section 7.0 has no such descriptions. In section 3.2.1 "detailed food and feeding information" is promised. Table 3.2-1 can hardly be considered detailed information on food and feeding, even overlooking the inaccuracies it contains (such as cod not feeding on crabs). The food web, 3.2-41, cannot be the detailed information, either (particularly because we see that figure indicating cod don't even eat capelin, a pelagic species). Section 3.2.6.8 stated that section 3.2.4.3 noted large numbers of eggs were produced, but few survived. Section 3.2.4.3 did not make such a statement.

All such factual errors and internal inconsistencies need to be found and corrected. Volunteer groups are not the appropriate sector to do such a detailed evaluation of the EIS. Such an evaluation is nonetheless necessary, so all reviewers know exactly what view of the environment is held by the proponent. Only then can reviewers comment meaningfully on the validity and accuracy of that view, and on how well that view is translated into careful, effective, and sensitive project operations and monitoring.

VI: MISCELLANEOUS

Section 4.2.1 fails to quantify potential impacts in a useful and meaningful way. We have no idea what taxa are taken in with seawater used in the site. We have no idea what hydrocarbons are released. We know how big an individual burn is, but not how many burns will occur. We cannot evaluate impacts without more specific information.

We are continually assumed that the Grand Banks ecosystem is like the North Sea. This is a vital point, as the proponent is basing assurances that project operations will work, and the ecosystem will respond in certain ways, on that similarity. The data we have to compare the ecosystems is table 3.2-32; few data with large variability. Given the importance of this similarity of the ecosystems to the proponent's arguments, we should see a detailed comparison of the two ecosystems, where standards for how similar is 'similar enough to behave the same way' are presented, a priori, and justified.

We object to the 4 categories of potential impact (Table 4.1-3), because we feel the scale is warped in favor of making anything less than massive disasters fall into an innocuously labeled category of "minor" or "negligable". We will discuss our objection in our later submission, but as a deficiency, we would like to have each type of category illustrated. Readers could then have some meaningful idea of how large an event can receive a label of a "minor impact".

We look forward to the responses of the panel, and of the proponent, to the concerns we raise in this submission. Thank you for this opportunity to participate in the important process of reviewing the potential environmental impacts of the Hibernia development.



UNITED CHURCH COUNCIL OF SOCIAL MINISTRIES

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July 25, 1985

Hibernia Environmental Assessment Panel
6th. Floor
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Dear Sir/Madame:

The United Church Resource Development Committee has reviewed Vol. 4 of the Hibernia Environmental Impact Statement and some of the related component studies. We have found the document to be informative, but of limited value for either of its intended purposes. In short, as a planning tool for accommodating the development, or as a data base for public decision making on the merits or options of the Hibernia development proposal, the EIS has many serious short-comings.

We recognize that these deficiencies are generated by a multitude of related factors (i.e. the scope of the assessment, the uncertainties surrounding the project logistics, the inherent problems with data bases, and application of SEIS techniques, etc.), and are, to a degree, inevitable. However, acceptance of this fact, while it may absolve or redirect responsibility for the situation from the proponent, does not ameliorate the difficulties we face in carrying out our tasks.

As a community based agency involved in implementing social services, and as Christians, compelled by faith to exercise stewardship of the Creation, we have our own terms of reference to fulfil.

Over the past year, these have led the Committee to explore many aspects of this proposed development, and in particular to question its secondary and long-term promise for our population. We have isolated a number of critical issues related to:

- a) the rationale for the project;

- b) costs of development, and
- c) induced social service needs, that we feel are inadequately addressed in the Hibernia EIS.

We would like to use this opportunity to bring these to your attention and ask for your assistance in clarifying the information presented as well as forging the missing analysis.

Our critique of the Hibernia EIS may therefore be unusual in that it seeks not to challenge conclusions or methodologies of the assessment, but to extend them another analytical step. Nor do we quarrel with the proponent's presentation of data except to point out significant omissions, and to state our agreement with other public commentators that, given the potential for change in the project, a high-low case scenarios for impacts would have been more appropriate and useful to the public and social service planners. In taking this approach, we hope to contribute to your own difficult mandate of recommending to government on whether, and how this project may proceed.

Sincerely,

Joanne B. Cag/for the
United Church Resource
Development Committee

JBC/pg

I. PROJECT RATIONALE:

In its rationale for the Hibernia project, the proponent states its belief that "the development of the Hibernia field contributes to national goals of energy security and crude oil self-sufficiency, as well as, providing economic development opportunities in the Atlantic Provinces" (Vol. 4, p.3).

In support of this statement, they present charts on oil supply and demand balances (p.3), and net oil trade balances (p.224 & 226) that display energy gains accruing the project as well as the cumulative stimulus it will have on provincial and national economies. (Sections 4:3 and 4:4). These two sections also provide information on cumulative impacts (economic and employment) by industrial sector and projections on three other macro-economic indicators (i.e. national and provincial E.D.P., unemployment rates, and Canadian C.P.I.).

There is, however, no discussion of the assumptions/ criteria underlying the base case/Hibernia scenarios, and very little descriptive explanation of the significance of these projected increases given within the Vol. 4 summary. Moreover, no attempt was made to quantify, or even assess the likelihood of inflationary pressure on the provincial economy.

The review of the macro-economic analysis prepared by Gunther and Sonnen states that the Hibernia impact scenarios incorporate:

- 1) a world oil price of \$29 U.S. increasing 5.5% annually from 1985 through the life of the project;

- 2) a static inflation rate of 5.5% and 6% in the U.S. and Canada respectively, and
- 3) a constant Canadian exchange rate of \$.80 U.S.

These scenarios are set against a fairly conservative forecast of economic growth in Canada and Newfoundland, which the consultants assess as "one that would receive general, although not unanimous, support from the majority of experienced users of this tool of analysis". (Gunther and Sonnen p.16).

It is beyond the capabilities of our Committee to comment on the viability of these forecasts and sectoral analysis, however, they appear to be contingent upon numerous variables which are not acknowledged in the EIS. The United Church Resource Development Committee thinks that the following additional information would be beneficial to the Panel's and public's assessment of these impacts:

- 1) A description of current and projected global production and demand for light crude oil including corresponding price estimates.
- 2) A rationalization for, and quantification of the projected increase in Canadian oil consumption used in the graphs on p. 3 of Vol. 4.
- 3) A discussion on whether, and how, recent changes in Canadian oil pricing and revenue regimes will affect other Canadian oil production and consequent oil trade balances.
- 4) A discussion of what effect the projected increase in trade deficits (estimated at \$2.6 billion) in the development phase will have on economic growth. In particular, it would be important to determine what percentage of this might be incurred through foreign debt financing or direct investment.

- 5) An evaluation of the potential for Hibernia induced changes in the Canadian dollar, and how this would affect other export dependent resource sectors during the development and production phases.

II. COSTS OF DEVELOPMENT:

Volume 4 of the Hibernia EIS provides an impressive list of infrastructure required for servicing development of the Hibernia field. A partial cataloguing of these needs, derived from the EIS, and several component studies, indicates that federal-provincial government financing will be necessary for much of this construction, and servicing.

Planning for provision of some of these needs is evidently already in place (e.g. airport facilities, hyperbaric medical facilities) but there is no discussion of priorities, or how such expenditure will affect government accounts. Moreover, since many of these needs are attached to direct or indirectly related on-site developments, responsibility for assessing demographic, environmental and other impacts is ascribed to future applications of the Provincial Environmental Assessment Act. The same argument is used for the lack of information on coastal impacts (particularly the effects on the inshore fishery in Placentia Bay). While this reallocation of impact is technically within the terms of reference for the Hibernia EIS, it makes little realistic sense. Presumably, construction of this required infrastructure will proceed coincidentally with Hibernia onshore site developments, and will thus create competitive demands for labour, materials, services and capital. While such construction may have

little effect on overall supply, it could compound strains placed on local, rural community. Therefore, demands created by these coincidental projects should be fully assessed before the EIS pronouncements on rural impact areas are accepted by the Panel. Similarly, while the terms of reference again, preclude examination of the potential for, and cumulative impacts of other offshore field developments, it would seem prudent for the Panel to investigate this topic (possibly through comparative experience) in order to:

- a) prepare recommendations on accommodation of subsequent field developments, and
- b) assess the relative net costs of such physical infrastructural servicing under each production system.

The necessity of carrying out such work, is perhaps best demonstrated by looking at a single aspect of these infrastructural pre-requisites - namely electric power.

As required by the terms of reference, the EIS lists the electrical energy requirements of Hibernia related construction sites, as well as increased demand created by operations in St. John's. These projected loads vary by production system, but levels are such that new transmission could be required to Argentia, and Adams Head. In these instances, the consultants' report, notes that construction of these lines would entail 18 to 36 months, and adds that "If the demands at Argentia and Adams Head are for only a few years, then the costs for the new transmission facilities will have to be borne mostly or entirely by the developer, rather than NLP". (Karasek, vol. 11, p. 2).

Over and above these costs, the EIS notes that consumer demand (without Hibernia) is projected to outstrip all Island generating sources by 1991, and that Hibernia-related demand might be expected to nudge forward implementation of plans to expand servicing. Thus, it is logical to assume that development of Hibernia would require not only new transmission lines, but also, like the rest of us, additional generating supply. Since the Hibernia development, and any other oil field development would require industrial loads that are not feasible through alternative or soft energy paths, the only source noted in the EIS is the proposed Gull Island development and associated 800mw in-feed from Labrador to the Island. Further consideration of this need is restricted to:

- a) the consultants' concurrence with a quote from Newfoundland and Labrador Hydro's 1983 annual report indicating that "a decision on a new generation source for Island needs will likely have to be made by the end of 1985", (Karasek, vol. 11, p. 10), and
- b) a paragraph in the appendix of Vol. 4 which will be discussed later in this report.

This situation is one of immense concern to our Committee for a number of reasons. First, until an additional generating source is brought on stream, energy needs for the Hibernia development will have to be met through the existing supply system. Without more detailed information on the nature and timing of the Hibernia related demand, it is impossible to see how it can be met without increased use of oil-fired generators.

Unless a financial agreement is made with site developers, this could mean increased fuel adjustment rates for NLP household consumers. Given the difficulties high electricity rates are now creating for families throughout the Island, we request the assistance of the Panal's technical experts to address the following questions:

- 1) What will be the time frame and demand characteristics of the electrical energy requirements identified in the EIS?
- 2) How will these requirements impact on existing Island supply capacities?
- 3) If increase oil-fired generation is necessary to meet these requirements, what will be the average increase in financial costs to household consumers?
- 4) What would be the electrical energy costs to the developers of these Hibernia-related sites, if additional generation costs are not distributed to Island consumers?

Secondly, although the macro-economic analysis done for the Hibernia EIS incorporates development of the Lower Churchill projects into the provincial GDP forecast (Gunther and Sonnen, p. 22), it is unclear to us whether these project requirements were injected into other aspects of the socio-economic impacts assessment. In Appendix A.1 of Volume 4 of the EIS, information is provided indicating that, if started in 1987, development of the Gull Island project and in-feed line, would take seven years and require a peak work force of 5,000 people. Nevertheless, the section concluded, that because of the "uncertainty surrounding the nature, magnitude and timing of labour demands arising from possible concurrent projects meaningful adjustments to supply to reflect actual availability

are impossible to make" (EIS, vol. 4, p. 347). We can only interpret this statement to mean that absolutely no attempt was made by the proponent to determine how this one necessary concurrent development would impact on logistics for the Hibernia project.

Since, as we have pointed out already, the EIS consistently stresses that variations in its projections of labour supply and the availability of goods and services would alter its socio-economic assessments, we strongly recommend that the Panal investigate the incremental requirements of Hibernia and the Gull Island/transmission line developments, especially as they relate to labour supply, wage rates, inflation, transportation capacity, and in-migration.

Before concluding this section, we would like to ask your technical experts for advice on one other matter arising from this situation. As the authors of the EIS recognized, there are immense "stumbling blocks" to development of the Gull Island/transmission line generating option. We would like to know, therefore, what contingency plans exist, or are possible to meet household and/or Hibernia induced industrial demand for electrical power in this province.

If no alternative generation sources are feasible, then we request your technical experts' advice on what the domestic price of Lower Churchill electricity would be for Island residents under the current fiscal management regime, and under the policies proposed for the electrical sector by the Economic Council of Canada in their recent publication, Connections, and energy strategy for the Future.

The basis for this latter request is not perversity, but the results of simulations carried out by the Council to estimate the impact on real prices of electricity resulting from implementation of some or all of their recommendations. They report "For the four provinces that were analysed - Ontario, Saskatchewan, Nova Scotia, and British Columbia, our simulations indicate that the price increases in relation to a control solution based on the continuation of current policies could range from 30% in Nova Scotia to as much as 65% in Ontario in the year 2000". (Connections, p. 149). We bring this to your attention, so that any analysis carried out by yourselves on the matter of providing power for development of Hibernia energy will consider the additional costs implied in these policy proposals to the developers and the consumers.

III. SOCIAL SERVICE NEEDS:

Of all the issues discussed in the Hibernia EIS, it is the coverage of impacts on community as social service infrastructure that has drawn the most fire from public interest groups. The concerns raised by service agencies mirror our own, and may be precised as follows:

- 1) All of the assessments of required needs are based on demographic trajectories that combine rates of normal population growth and movement with estimates of in-migrant employees required to carry out possible operations in an area. The resulting figures for "with-Hibernia population growth" are then superimposed on an inventory of existing and planned infrastructure and conclusions developed as to the adequacy or deficiencies of each item included in the survey (i.e. housing, recreational facilities, correctional services, public health, etc.

The utility and viability of the resulting conclusions have been challenged on many grounds including:

- a) the model is not sensitive to probable changes in the scale of site operations;
 - b) the model is not sensitive to changes in normal population growth and patterns that might arise through speculative in-migration, induced or indirect employment, and
 - c) the assessment of needs does not include those of workers involved in providing physical infrastructure to construction sites.
- 2) There is limited assessment of the financial costs involved in meeting listed deficiencies in services, or of the lead time and planning required to provide them.
- 3) Assessment of significant issues (e.g. measures needed to insure the health and safety of off-shore workers or disposal of wastes at sites) relegated to other examining bodies (e.g. the Ocean Ranger Royal Commission, the provincial Department of Environment).
- 4) Procedures for abandonment of land or sea production sites are non-specific. No original research was undertaken to improve or augment the existing data base on current levels of social needs among populations.

It is the opinion of this Committee, however, that the greatest failure of the process, lies in its inability to evaluate or ascribe responsibility (moral, financial or regulatory) for the "downside" of the Hibernia development. Consequently, the EIS in section 4.9 treats

us to disturbing commentary on possible increases in social problems, but pays no attention to the reality of meeting these.

With their understanding of the current barriers to expansion of services, and the number of marginalized people in this province, simple statements on possible increased needs cannot be tolerated by community agencies without further clarification of our governments ability to provide adequate assistance during the development phase. To achieve this, agencies must have some quantification of social risks involved.

As stated in our opening, the United Church Resource Development Committee recognizes that there are many obstacles to providing such information, and we agree with the proponent that a system for monitoring community and social service needs must be put in place as quickly as possible. However, we would like to demonstrate, through the proponent's own examination of the housing issue, the relevancy of agencies concerns and our opinion that monitoring is not a sufficient response.

In the background report, prepared by Consult Associates Limited, we are given the following information:

- 1) Following the 1979 commercial find of Hibernia, housing starts in the St. John's area nearly doubled in 1980 and the average sales price of units increased by 23.6%.
- 2) "a major influx of Mobil staff in late 1983/early 1984 created an unwarranted, yet artificial increase in market rental rates in certain segments of the St. John's rental market" (Consult Assoc. p. 7).

- 3) Provision of social housing units has not kept pace with either the builders (i.e. government housing agencies) targets or with demand.
- 4) The vacancy rate for rental units (excluding basement apartments) for October 1984 was 1.3% or 66 units.
- 5) Meanwhile the proponent's projections for in-migrant single household (presumed renters) indicate a peak annual demand of 127 and 134 in 1991 under a fixed and floating system respectively.

The study concludes that there may potentially be supply/demand imbalances in the formal rental market, and likely negative impacts through inflation and displacement on low income families.

Despite this, the consultants give no analysis for the shortfall in social housing targets or of the future capacity of these programs to meet need. On this point, we would like to draw your attention to data provided at a workshop on off-shore development, held in St. John's on April 12, 1985. (Report attached). At this session participants learned, that the current waiting list for Newfoundland & Labrador Public Housing is 650 families, while an additional 150 are on the list for municipal non-profit housing. The presenter emphasized that these are "qualifying" families, and that the demand is actually much higher. He went on to state, that there has been a cut in the supply of public housing for St. John's, so

that while 100 new units per year had been planned for 1985 and 1986, 75 will be built under Canada Mortgage & Housing Corp., and 90 under Newfoundland & Labrador Housing programs. In this case, a monitoring system tells us that it will take approximately 10 years to fulfil documented 1984 demands.

The consultant's report also fails to address the question of need for social housing in the rural impact areas-other than to note, that an application by the Town of Jerseyside to Newfoundland & Labrador Housing for a public housing project in the community, "could not be justified on the basis of need and demand studies, when compared to more pressing needs in other areas of the province". (Consult Association, p. 69).

In regards to the accommodation of large work forces in rural impact areas, the consultants make four recommendations on pp. 93 & 94 that appear to have been drawn from the one relevant study referenced in their bibliography. However, no attempt is made to indicate a preferred location or size of camp, the pros and cons of flotillas vs. land units, required facilities, costs of maintenance, etc. Furthermore, the proponent makes no commitment, within the EIS, to implement any of the recommendations on provision of housing contained in this report.

From this brief discussion of only one element of the community and social services issue, it is obvious that monitoring has not, and will not by itself provide either services or protection to those who will be least able to bear the brunt of market and socio-cultural changes ignited by off-shore oil development.

In some instance, additional research is required to establish the existing deficiencies in housing, public health care, education, financial assistance, etc. Further investigation into the current and projected level of government and community services is essential in order to anticipate adjustments required to keep pace with future needs.

In other areas (e.g. provision of work camps) further research into individual's and communities' experiences with such accommodation is required for planning of appropriate facilities.

Provincial training and education programmes (particularly funding assistance) should be looked into, to identify affirmative programmes for youth, the unskilled, and women in respect to employment opportunities arising from oil development.

Employment practices by the proponent should be investigated further, and specific policies on recruitment and training developed.

Current regulatory regimes for land use, environmental protection, worker safety, housing, transport of goods, etc. should be evaluated or implemented in impact areas prior to approval of development proposals.

By and large, the EIS recognizes the need for each of these points. However, the proponent has no authority to implement many of them, while responsible agencies have no resources to carry them out.

As a final comment on this situation, the United Church Resource Development Committee recommends, that the Panel pay close attention to the details of any monitoring system attached to the Hibernia development project. Such a system must not only collate indicators of changing needs for annual statistics and longitudinal review, it must allow for quick response to rapid developments, and co-ordination of the work of various government and community service agencies. In short, both because of the pace of the development project, and the community-based structure of the existing delivery system, the system must, above all, be participatory.

IV. SUMMARY:

In conclusion, we wish to reiterate our purpose in filing this submission. We are in the midst of an environmental assessment review process that is meant to be a crucial part in the decision-making for a major resource development project. We have examined sections of this Hibernia EIS, and deem it to be insufficient in information and analysis for adequate public input into this process. In this report, we have illustrated some of our concerns with the document and formally entered these into the process.

APPENDICES

1. Report of the Offshore Petroleum Development Workshop.
April 12, 1985.

2. Summary bibliography of S.E.I.A. research projects
compiled by Social Research & Analysis Division,
Petroleum Directorate.

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REPORT

OF THE

OFFSHORE PETROLEUM DEVELOPMENT WORKSHOP

HOTEL NEWFOUNDLAND

ST. JOHN'S, NEWFOUNDLAND

FRIDAY, APRIL 12, 1985

On Friday, April 12th., 1985 the Alliance for Community Planning (Oil & Gas) held a workshop on Petroleum Development attended by approximately 30 representatives from community agencies. The day's proceedings highlighted the following issues.

Session I. Perspectives on the Oil Industry - Mark Shrimpton

- decisions taken by the oil industry on exploration drilling are based on an inexact process that incorporates standard structural characteristics of petroleum reservoirs with the findings of seismic and exploration work into recommendations to company management.

The data and recommendations are then combined with information on the costs of production methods (including government regulatory requirements regarding construction, training, environmental protection, etc.) in a decision making process fraught with further unknowns. Critical factors in the decision making process would include therefore:

1. projected recoverable oil deposits;
2. economic costs of production;
3. anticipated price for oil over the life of the field;
4. projected markets for product - encompassing changes in consumer demand, and
5. anticipated rate of return to the company.

Session II. Offshore Development and Production Alternatives. Susan Sherk opened the session by comparing the North Sea and Hibernia developments. Highlights of her presentation were as follows:

- although exploration of Hibernia and the North Sea fields began at approximately the same time (1967), development has been worlds apart. E.G. over 2,225 exploration wells have been drilled in the North Sea, and only 100 in the Grand Banks - Labrador permits.

- at any one time there were 100 drilling rigs operating in the North Sea, while the maximum here has been 9 (the average number is 5).
- In the North Sea there were 5 major finds (discoveries) within 3 years of exploration. It took 13 years for one major discovery in offshore Newfoundland and none has been proved since.
- Over 100 production licences have been issued in the North Sea covering 30 oil and 10 gas fields now in production. None have been approved here and no production has started.
- The estimated volume of one field (Stetford in Norwegian waters) at 3.3 billion barrels is 3 times that estimated for Hibernia.

While one might argue that the massive differences in development of the North Sea and the Grand Banks is attributable to the effort put into it by the companies, Ms. Sherk detailed the following reasons;

- the North Sea fields are much less complex (Hibernia is heavily faulted);
- the regulations regarding production were much lower;
- oil prices are higher;
- the threat of an oil embargo spurred development;
- oil development was regulated by single national governments and did not involve provincial/federal disputes as here, and
- environmental constraints were not as great in the North Sea (i.e. no ice).

Ms. Sherk continued by adding that some positive differences have also emerged and cited the level of community consultation over development that has occurred here, the level of social-economic research and the fisheries compensation program that has been put in place.

She also related that the Atlantic accord which has established revenue and regulatory regimes for the industry as a possible boost to development and indicated that future decisions on whether to proceed with continual exploration and development will depend on:

- a) would price of oil and consumer demand (markets);
- b) government financial incentives (i.e. what happens to P.I.P., what provincial corporate tax structures), and most importantly,
- c) whether there is another major discovery.

The production alternatives now being considered by Mobil for Hibernia were described by Mr. Wayne Kubasek (productions engineer) who began by describing the reservoir features. Hibernia, it turns out, is heavily faulted which means that the oil bearing rocks/pools are thought to be in little pockets rather than a continuous field. Mobil estimates that a production rate of 7,000 to 20,000 barrels per day is possible, but more wells would be required to match North Sea rates.

Increasing production rates through wells, however, would reduce the life span of the field and this would have a significant impact on the economic feasibility of the two production systems under consideration.

The alternative production systems described by him included:

- a) Gravity based System (GBS) which consists of a massive concrete bottom (350 feet in diameter, extending 80 feet above water line) top by rig platform containing, accommodation and production facilities. Storage for oil would be contained

in the base and utilized in ballast; transportation would be by shuttle tanker from 2 stems (loading facilities) at varied distances from the rig. The rig itself would be able to withstand impact from a 100 ton iceberg and thus protect wellheads as well, Manifolds, pipelines, the stems (pipe), etc. cannot be protected from potential ice scour and are deemed sacrificial. Thus the design must allow quick shut-down and flushing of lines to prevent spills or blow-outs. Mr. Kubasek, described this system (in response to questions) as being both technologically and environmentally sound, but could not say whether it is economically feasible.

- b) The other two options described were variations of floating production system. One incorporates semi-submersibles or drilling ships with a ship shape storage facility and shuttle tankers. All of these components could be moved in the case of severe weather/ice conditions, but lost production time in this event could be considerable. There are also the problems of:
 - 1. protecting well-heads, risers and other production equipment if the rigs/ships have to be moved, and
 - 2. a drill ship large enough to contain production facilities has yet to be built.

The size of shuttle tankers is also an issue here since those deemed economically preferable are too large to be built in Canada.

- c) The third option discussed was a concrete floating production system known as a removable bottom floating structure (RBFS). It has the advantages of protecting people, production facilities and

well heads and unlike a GBS could be removed after the field is depleted. However this type of system has yet to be built or used anywhere as well.

Other points clarified in the discussion were:

1. an oil pipeline to shore is not possible because of:
 - a) the nature of the oil (its pour point and waxiness would require large diameter pipes and, repumping stations and over expensive maintenance), and
 - b) the possible routes span Iceberg Alley and the bedrock under them too hard for trenching. Hence the environmental risks from ice damage are too great for construction.
2. A gas line is also unfeasible because of environmental risks while at site production (LNG's) are precluded by both risks and the gas market situation.

In light of this, Mr. Kubasek offered the following time line for development:

- 1985 - completion of conceptual work on production system.
- 1986 - design of system.
- 1987 - construction of system/preparation of well head sites.
- 1990 - production begins at Hibernia.

While warning that because of the short weather window for placement of facilities (May to October) this time frame could easily be disrupted.

Participants were also told that the announced date for release of the Hibernia Development Plan (September 1985) could be affected by the pace of negotiations between governments and the industry over revenue regimes.

Session III. Hibernia Environmental Assessment Process -
An Overview.

Part A:

Ms. Bonnie Hill, staff person with the Hibernia Environmental Assessment Review Office (HEARO) opened this session with a description of the public review process.

She described it as a federal/provincial review that would be neutral or non-political in nature. The structure of the review will be as follows:

May 15th. - EIS is released - copies of summary will be sent to those on HEARO's mailing list.

Component/background studies to the EIS will be placed in selected information centres that have yet to be identified.

- within 20 days, HEARO will publish (in local newspapers, on radio and television) location of public information sessions.

Sites will primarily be in the Burin and Avalon peninsula but other sessions can be arranged if interest is indicated to HEARO.

Mid to end of June - public sessions will be held in these communities.

Sessions will be informal, Mobil representatives will explain the development project and respond to questions from participants. Intervenors are asked to register their intent to appear at a

public information for planning purposes but this is not required. Intervenor can also submit written comments on the EIS up to about August.

Verbatim accounts of the sessions will be made and summaries circulated to the Information Centres through a newsletter.

Any unanswered problems, concerns, questions raised by participants over the EIS (in sessions and briefs) will be published by the Review Panel as a deficiency statement. These deficiencies must be publicly addressed by Mobil.

Mid-August - (date dependent upon state of EIS and availability of development plan).

- development plan to Hibernia released and circulated to those on mailing list and to information centres.
- within 20 days, HEARO will publish selected sites for public hearings.

Mid-September to Mid-October.

- General sessions will be held at which participants can present orally prepared statements or comments on issues related to the development plan contained within the scope of the Panel's mandate. Those presenting a prepared/written statement are required to give a copy of this to the HEARO secretariate one week in advance of the sessions and restrict their presentation to 20 minutes. (Additional time can be arranged). Time will be allotted in each session for comment from non-registered intervenors. At the conclusion of each presentation panel and proponent representatives will be allowed to question the presenter.

In addition, and at the discretion of the Panel, technical sessions on specific subjects will be arranged to accommodate 'expert' presentations.

Community sessions (with more informal procedures) will also be held in potentially affected communities. Presentations at these sessions from non residents will be "discouraged" unless specifically invited by the communities.

Funding and support to individuals and community groups wishing to participate in the review process is restricted to:

1. funding to cover travel costs for intervenors living outside communities hosting sessions (e.g. Labrador).
2. technical specialists retained to assist and advise the Panel will also be available (in an advice capacity only) to review participants.

Any request for this assistance should be directed to the Panel in the form of question(s). A written reply will be provided by the technical specialists. All requests and answers will become part of the public record of the review process.

Fields covered by those technical experts' include:

Fisheries Ecology,
Sociology,
Economics,
Safety,
Oceanography,
Ice Dynamics, and
Sea Birds/Sea Mammals.

Once the public hearings are completed, the Panel will produce a report and recommendations submitted to the Minister of the Environment and Minister of Energy, and to the Management Board for a decision on the proposal.

HEARO is currently setting up shop (and address and toll free number will be announced soon) and investigating sites for sessions and information centres.

In the response to this presentation, Mobil representatives announced that they will be opening a "storefront" office in St. John's to answer questions on the EIS as of June 1st., 1985.

Part B:

The second part of this session contained a presentation by Rev. Bruce Gregersen on the public hearings held in Labrador on the Brinex proposal to establish uranium mining in Labrador. He explained how initial community reaction to this proposal developed - (essentially a small number of people within the church and community became concerned about the company's plan to ensure there would be no adverse health effects on workers and residents - e.g. handling of tailings) and the difficulty people faced over the question of employment opportunities vs. environmental/health effects.

He described two quite distinct hearings - The first held in Happy Valley/Goose Bay which was formal in structure - large auditorium, head table of panel and proponent representatives, television equipment - he argues was intimidating and discouraged local participation. The second one in Sheshatshiu was organized by the Band Council and held in a room that precluded formal arrangements/seating. He stated that as a consequence, people felt more in control of the session and raised concerns much more freely.

In responding to questions on the effectiveness of public participation, he agreed that whether a proposal proceeds or not is often dependent upon factors outside local control (e.g. markets, government policies, etc.). However, his presentation stressed the importance of a Panel's recommendations in the decision making process, and the fact that the report

will be good as local participation. It highlighted the point made throughout the afternoons session, that much preparation and research must be done by communities prior to the hearings and that the hearings themselves are only one part of the decision making process.

The content of Joanne Cag's critique of the public review process was based on the views in the attached press release. There was no disagreement expressed by the audience over the charge that the structure of the sessions (timing, access to resources and information, etc.) would hinder effective public participation.

The major question discussed was the significance of the exclusion of "project economics" from the scope of the Panel's mandate. Ms. Cag maintained that since it is as yet unknown whether or not legislation implementing the Atlantic accord will maintain separate public reviews of land based development sites, the right to examine the projected costs and benefits of such projects is critical to making decisions on the Hibernia proposal. Workshop participants did discuss this point and it was noted that:

1. the legislation for the Atlantic accord would contain the best of both existing sets of regulations, and
2. the EIS will contain a preliminary benefits plan outlining employment and expenditures arising from production alternatives.

The central and opening question of the discussion, however, whether HEAP is to be used to inform, consult or involve people of this province in the decision making about development of Hibernia remained a matter of personal opinion and initiative.

Session III - Panel discussion - Onshore Impact.

Dr. Keith Story opened this session by identifying two "general perceptions" about Hibernia that have appeared in his work on the EIS. These are:

1. that characteristics of the project are understood - that decisions on the project have been made and people know what the socio-economic impacts might be, and
2. these impacts have been identified and measured.

Both perceptions, he argued are untrue for there are many things that cannot be answered until the project begins.

As examples, he cited:

- a) the volume of recoverable reserves. Estimates on the petroleum in Hibernia have changed radically in 4 years and the truth will only be known through production, and
- b) the method of production. The system chosen will largely depend on the revenue regimes now being considered by the governments, business reactions to the Western Accord, and the details of the forthcoming federal budget. These unknowns, he stated will have very significant impacts on such things as the cost of infrastructure for the development, employment levels, revenues.

Thus he termed the Hibernia proposal as an "unbounded project" and argued that likewise, the EIS may not be a correct document. For instance, some of the impacts considered are unmeasurable (e.g. effect on lifestyle, amount of speculative migration) and will only materialize through the operation of the project. For this reason, he emphasized the need for constant monitoring of the situation and the viewing of the public review process as part of a development continuum.

In response to questioning on speculative migration, panel members explained the difficulty in developing measurements for this phenomenon (no sample possible, comparative data inexact) but cited a study done in 1981 using returns from MCP applicants that showed 5% of respondents as having moved to the province to take up employment in the oil industry and a further 5% who came in anticipation of employment opportunities from oil development.

Regarding questions about the accuracy of EIS data, it was argued by the panel and Mobil representative that methods used to assess levels of service and need were adequate with the exception of social services where no base-line data exists. It was explained that the costs of conducting such research precluded doing it.

The second panelist, Mr. Richard Fuchs, provided us with an overview of the findings from social impact assessments carried out here and elsewhere in relation to energy development.

For instance, the year of greatest activity in the offshore was 1973 and in 1984 the industry provided approximately 2,000 jobs, 1,300 - 1,400 of which were held by local residents. The industry spent from \$50 to \$150 million dollars keeping about 70 firms busy.

In regards to macro economic impacts, data shows that:

1. the regional distribution of employment from the off-shore has become more equitable;
2. the level of participation by rural/urban residents has also equalized;
3. only 2% of the off-shore labour force has come from the fishing industry with the largest number coming from construction trades and water transport industries, and
4. career commitment of local and imported workers is about equal.

Thus he stated, we have as a people accepted and adjusted to the industry well to date. The question of how well we will do in the future, he handles through comparative data which reveal wide extremes and variation in impacts (handout attached). Using this evidence, Mr. Fuchs stated that impacts that occur will have much to do with the place as with the project.

He also showed a schematic of a five year research plan implemented by the Petroleum Directorate which includes:

- a) Steel Island II - a follow up of labour/employment features;
- b) Women and the Offshore - an investigation into the factors influencing women's participation in the off-shore (e.g. only 154 women are among the 712,000 names registered for employment with the provincial off-shore employment service;
- c) Long-distance community - an investigation into the possibility of commuting as a means of maximizing regional distribution of employment benefits;
- d) Social pathology - a monitoring process using secondary data (i.e. statistics from service agencies) and local interviews to identify regional social problems;
- e) Costs of Living Impacts - this study will focus on increases in commodities and services;
- f) Participatory research - (information not recorded), and
- g) SIAS - investigation of social impact assessment studies used in Environment Impact Statements.

The third presentation, by Mr. Mark Shrimpton, zeroed in on the housing situation in St. John's and how it might be affected by oil development.

In documenting the current situation, Mr. Shrimpton explained that 69.5% of the housing in St. John's is in private ownership and that there is considerable area available for new home construction. Moreover since:

1. land ownership is (with the exception of a few areas) highly fragmented with government being the largest single landowner, and
2. the construction sector is underutilized, there is ample room for growth.

Within the private ownership sector too, speculative price rises, such as that which followed the Hibernia discovery, are not considered a problem.

The problem, he stated, exists for two groups - new family units entering the housing market and renters.

In elaborating on this latter point, Mr. Shrimpton explained that the 30.5% rental occupied stock translates into 14,000 units, 2,500 of these are public units with a further 200 developed under social housing programs, 25% is in private business rentals which was largely sparked by:

- a) changes in municipal tax structures;
- b) government investment incentives, and
- c) growing consumer demand for rental units caused by expansion of non-family units (e.g. students, transient workers).

Recently though he pointed out that there has been a collapse in the rental sector so that only 6% of the new supply from 1983 to 1985 was in rentals.

Consequently the vacancy rate in the city as of October 1984 was 1.8% with much of this being in the higher priced units (\$800 - \$1,000 price range). At the same time the demand for public housing continues to rise. There are currently 650 families qualifying for public units on the waiting list and a further 150 qualifying families on the list for municipal non-profit housing. Despite this high demand there has been a cut in the supply of public housing (e.g. while 100 units per year had been planned for 1985 and 1986, only 75 units will actually be built-under C.M.H.C. programs and 90 under the N.L.H.C. program).

Thus, he concluded that if the 15% of demand figure cited in the EIS is realized in the rental sector - and he maintained that given the nature of the occupations, this is likely, the effect on rental housing could be very detrimental. There are, as yet, no programs or planning in place to deal with the situation.

CONCLUSION:

Participants were invited to wrap up the day through commentary and evaluation. Given the lateness of the day, little was said, so the Chair invited participants to respond to a statement on HEAP developed by the Alliance steering Committee. After a reading, there was a consensus that the statement should be extended to include suggestions for ways and means for community participation in the public review process.

The Chair then presented a short description of the work and functioning of the Alliance to date and announced receipt of funding from Secretary of State in the amount of \$4,500 which will be used to provide further education/information forums. Participants were encouraged to attend an organizational and planning meeting of the Alliance set for May 7th., 1985.

Evaluation: (Written by Joanne Cag from comments and discussion with organizers and participants).

Participation: While attendance at the workshop was adequate, (24 registrants, 2 observers, and 8 resource people) a look at the registration list reveals the following. The majority of participants represented women's organizations, churches, government and professional service agencies.

Regional representation was poor (only two people were from outside the St. John's area) and, although many community based service agencies had pre-registered for the workshop, 5 did not attend. The lack of regional participation is undoubtedly due to location and timing (e.g. the workshop conflicted with the Rural Development Association Annual General Meeting). The non-appearance of service agencies, however, is harder to explain.

It might be due to the perspectives described by Mr. Story, but the general focus of the workshop content may also have been a factor, in that it failed to address specific effects on the mandates or programs of these agencies.

Since such information (e.g. on employment, training needs, environmental impacts, counselling/recreation services) is not yet available, this should not be interpreted as a failure of the organizers or session. Rather, the comment is made to highlight the need for single-focus or in-house agency sessions.

Content:

Given the restraints affecting presenters (inability to discuss EIS research, the in-progress nature of HEAP, the unknown of the development plan) the information and discussion was very good. Aside from the facts, figures, definitions and explanation provided, participants were exposed to several important viewpoints on off-shore

development. Chief among these was that off-shore development is a process that has already begun, whose 'success' is defined by local response as well as external events. Consequently, the need for planning, monitoring and preparation was constantly reinforced in our dialogue.

Follow-up:

The discussion presented examples of planning projects being carried out by community groups (e.g. local labour surveys) and identified several groups that might be further involved (e.g. municipalities). It also highlighted problems with the review process related to access to information and resource people and the structure of the sessions themselves, which should be beneficial to both organizers and intervenors. It also raised issues (e.g. the economics of the development) which might become the focus of future research by the Alliance.

Overall, the principle benefit of the workshop was to underline the need for a co-ordinating body in the process - and the Alliances determination to perform this service.

Appendix A

Empirical Studies Pertaining to Social Problems in Energy Development Regions

Author	Project Type	Impact Location	Relevant Peak Labour Force	Population Change	Subjects Covered	Direction ¹ of Change (-, 0, +)	Data Source	Comments
Alken and McCauley (1982)	Offshore oil development	North Sea platform workers	N/A	N/A	Alcohol Consumption	N/A	Survey (N=213)	Study of self-reported on-shore alcohol consumption.
Caetano et al (1983)	Offshore oil development	Shetland Islands	6,000 (temporary)	25% (1975-1978)	Alcohol Consumption	+	Survey of Community Residents	Longitudinal, comparative design.
Covey and Menard (1983)	Oil shale and coal development	Ten Colorado counties	N/A	Minimum of 8% annually	Crime	+	Uniform Crime Reports	Longitudinal, comparative design.
Dixon (1978)	Alaska oil pipeline construction	Fairbanks, Alaska	16,000 hired through Fairbanks	39% (45,571-63,350 from 1973-1975)	Crime Juvenile Delinquency Alcohol Abuse Divorce Mental Health Welfare Dependence	+ + + + + -	Police Statistics Agency Caseloads	Multiple sources of information. Very good. No comparison areas.
Foster (1980)	Offshore oil development	Beaufort Sea Communities	224 Northern employees	8% (5706-6044 from 1975-1979)	Crime Alcohol Consumption (1975-1979) Alcohol Consumption (seasonal)	+ 0 +	RCMP HWT Liquor Control System.	No comparison area but compelling seasonal fluctuations reported.

1
- = decrease
0 = no change
+ = increase

Appendix A

Empirical Studies Pertaining to Social Problems in Energy Development Regions (Continued)

Author	Project Type	Impact Location	Relevant Peak Labour Force	Population Change (1974-1978)	Subjects Covered	Direction of Change (-, 0, +)	Data Source	Comments
Freudenberg (1983)	Coal development	Craig, Colorado	N/A	100% (>10,000 from 1974-1978)	Crime	+	Single Victimization Survey	No comparison community.
Gold (1974)	Coal development	Montana, Wyoming	N/A	N/A	AFDC Food Stamps	0	Government Statistics	
Killich et al. (1981)	NIL	Highlands, Shetland Orkney, Gaupian Regions	N/A	N/A	Alcohol Problems	+	Police and health statistics	Regional comparisons, not tied specially to resource development.
Kohrs (1974)	Oil development	Gillette, Wyoming	N/A	N/A	Family Problems	+	Impressionistic	Report based on unspecified sources. No comparison community.
Knox (1976)	Offshore oil development (Platform yards, pipe-coating)	Cromarty, Alness, Scotland	N/A	N/A	Freedom from Crime	-	Retrospective survey question	
Lafay (1976)	Offshore oil development	Peterhead, Scotland	2,600	5% (1971-1975)	Crime Children's hearings	+	Reported crime Social work Statistics	Comparisons with national trends provided.
Lapsley (1976)	Oil landfall terminal	Flotta, Orkney Island	1,700	6% (17,000 from 1971-1987)	Crime	0	Reported crime	;

Social Research and Assessment Division, Petroleum Directorate, 1985

Appendix A

Empirical Studies Pertaining to Social Problems in Energy Development Regions
(Continued)

Author	Project Type	Impact Location	Relevant Peak Labour Force	Population Change	Subjects Covered	Direction of Change (-, 0, +)	Data Source	Comments
Lantz and McKown (1979)	Coal development	Craig, Colorado	N/A	47% (county pop. 7,000-10,300 1973-1976)	Substance Abuse Emotional Disorder Family Problems Crime	+	Caseloads of local agencies	No comparison community.
Harvard and Covey (1984)	Oil shale and coal development	Colorado counties	N/A	Minimum of 8% annually from 1971-1979	Crime (Court workloads)	+	Court statistics	Comparative design.
Montgomery and Hambleton (1982)	Offshore oil development	Peterhead	N/A	16% (14,500-16,800 from 1971-1979)	Breach of Peace (1973-1977)	+	Crimes reported to police	
Moore (1981)	Offshore oil development	Peterhead	N/A	N/A	Crime Welfare Dependency Alcohol Abuse (1973-1974)	+	Police statistics D.H.S.S.	Comparisons with national trends provided.
Quarshie (1981)	Oil Sands development	Fort McMurray	N/A	175% (6,132-16,885 from 1970-1976)	Alcohol Consumption (1970-1977)	+	Alberta Liquor Control Board	Per capita consumption reported.

Social Research and Assessment Division, Petroleum Directorate, 1985

Appendix A

Empirical Studies Pertaining to Social Problems in Energy Development Regions (Continued)

Author	Project Type	Impact Location	Relevant Peak Labour Force	Population Change	Subjects Covered	Direction of Change (-, 0, +)	Data Source	Comments
Rosen and Vortheus-Rosen (1970)	Offshore oil development	Shetland	N/A	10x 17,327-19,069 (1971-1975)	Crime (1973-1975)	+	Annual Police Reports	Baseline data for longitudinal study.
Stangeland (1983)	Offshore oil development	Stavanger	18,800 (1979)	14x (1971-1980)	Social Assistance Alcohol Consumption Crime Divorce Suicide	0 0 0 0 0	Government Statistics	Very good. Per capita rates reported.
Welisz (1979)	Oil development	Campbell County, Wyoming	N/A	62x (16,000-26,000 1975-1978)	Mental Health Admissions	+	Institutional Statistics	
Wilkinson et al (1983)	Coal development	Montann, Nebraska North and South Dakota, Wyoming	N/A	N/A	Net migration and divorce rates	Negligible effect	Vital Statistics	Regression analysis to measure importance of net migration on divorce rate.
Wilkinson et al (1984)	Coal development	Rural counties in Western U.S.	N/A	N/A	Violent Crime	Negligible effect	Uniform Crime Report (FBI)	Regression analysis to measure importance of population growth and energy development.

Social Research and Assessment Division, Petroleum Directorate, 1985

Appendix A

Empirical Studies Pertaining to Social Problems in Energy Development Regions (Continued)

Author	Project Type	Impact Location	Relevant Peak Labour Force	Population Change	Subjects Covered	Direction of Change (-, 0, +)	Data Source	Comments
Wisniewski and Thompson (1981)	Coal development	Northern Grant Plains (U.S.)	N/A	x of 20% (1974-1977)	Social Assistance Payments	+	Social Assistance Statistics	

- = decrease
0 = no change
+ = increase

1 Direction of change: Usually refers to direction of change relative to comparison community. Where comparison community not available, refers to reported direction of change or absence or presence of a problem.

Social Research and Assessment Division, Petroleum Directorate, 1985

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Newfoundland Fishermen, Food and Allied Workers Union

chartered by the United Food & Commercial Workers International Union

COMMENTS TO THE HIBERNIA
ENVIRONMENTAL ASSESSMENT PANEL
CONCERNING
MOBIL'S
ENVIRONMENTAL IMPACT STATEMENT

August 1, 1985



Newfoundland Fishermen, Food and Allied Workers Union

chartered by the United Food & Commercial Workers International Union

August 1, 1985.

Mr. Bob Greyell,
Executive Secretary,
H.E.A.P. Office,
6th Floor,
Duckworth Street,
P. O. Box 1505, Station "C",
St. John's, Newfoundland.
A1C 5N8

Dear Mr. Greyell:

Attached please find our comments on Mobil's Environmental Impact Statement (EIS).

I would appreciate if you could bring this to the attention of the members of the panel for their deliberations on the scope and adequacy of the EIS. I would like to advise you also that Mr. Earle McCurdy will contact you in September to let you know whether a formal submission for the public hearings will be made by us.

Please keep us informed about key dates and public releases concerning the Hibernia Development Program.

Yours truly,

Mark Mueller,
Advisor.

MM:ns
Enclosure

INTRODUCTION

These observations draw your attention to a number of concerns and reservations about the scope and adequacy of Mobil's Environmental Impact Statement (EIS). In our view, these concerns and reservations should receive serious consideration in your review process toward the preparation of a deficiency statement and subsequently in your report on findings and recommendations. You will note that these concerns are by no means trivial and their resolution should contribute to a fuller public understanding of the socio-economic impact of the Hibernia Development Program on the Newfoundland economy in general and the fishing industry in particular.

FEDERAL AND PROVINCIAL GUIDELINES AND H.E.A.P. MANDATE

To set the stage for our concerns and reservations it is necessary to refer to the substance and scope of the Federal and Provincial Guidelines, the Atlantic Accord and your Panel's mandate. As you are aware, the Guidelines were issued several years ago (1980 and 1981 respectively) to guide the proponent in the preparation of the EIS.

Your own mandate, as a joint Canada-Newfoundland Review Panel, stems from the Atlantic Accord signed earlier this year which also provides for the creation of an Offshore Petroleum Board to whom you will also report your findings and recommendations. The Panel's terms of reference spell out clearly that you are to follow the Guidelines which predate the Atlantic Accord. They were drawn up based on the applicable legislation in each jurisdiction. But while you are bound to follow the Guidelines in your assessment, your terms of reference are also explicitly curtailed. Specifically, you are not to examine questions of energy policy, the fiscal and management regime, the economics of the project and the sharing of revenues between governments. These restrictions on your mandate are in conflict with the requirements laid out in the "Guidelines for the Approval of a Hibernia Development Program" issued by the Minister of Mines and Energy. In those Guidelines, the EIS is seen only as one component of this development

program, and other information requirements are spelled out before approval can be given.

We take the position that the Guidelines issued by the Minister of Mines and Energy are part and parcel of the Panel's mandate. Therefore, we maintain that the issues raised therein must be addressed by the Panel in its own deliberations and in the public review process. If the Panel chooses to neglect these issues the public will not be well served. They will fester, cause friction and bitterness creating suspicion and mistrust in the public's mind, defeating the purpose of the whole review process. The public must be presented with objective and complete information on the potential social and economic costs and benefits arising from the development of Hibernia. In our view, it is your mandate, task and challenge to ensure that this occurs.

GENERAL COMMENTS ON THE E.I.S.

Any reader of the 1,000 plus page EIS will note the overly descriptive approach which the proponent has chosen to employ. Whether by design or not, this approach does not serve the objectives of coming to grips with the social and economic benefits and costs originating from Hibernia. Indeed,

it is surprising given the resources which must have been expended in the preparation of the EIS, that the proponent has to a large extent, identified, catalogued and described. It is therefore the exception rather than the rule that measurable impacts are derived and presented in a coherent and consistent framework for public scrutiny and public discussion. The proponent is apparently fully aware of the purpose of the EIS because it is acknowledged in Volume I, Page 3 that with the EIS "... the public and government can judge the potential benefits and costs of the development." Unfortunately, the proponent does not follow this objective and proceeds instead with simplistic description and unsubstantiated assertions about benefits, and is even less forthcoming on the assessment of costs. It is apparent that the proponent has chosen a patronizing and paternalistic approach to the task on the assumption that the people of Newfoundland would be impressed by form rather than by substance.

It is now the responsibility of the Panel to assess these deficiencies in the EIS and request further documentation for the assessment. In order to aid you in this process specific deficiencies are outlined immediately below.

SPECIFIC DEFICIENCIES AND COMMENTS

I. Project Rationale

It is surprising that the proponent, who is seeking approval for a

development program amounting to between \$4.7 and \$5.5 billion is treating the project rationale in such a perfunctory and inadequate manner. We want to draw your attention to the following examples.

We are told (Volume I, pp. 8 - 9; Volume II, p. 14) that recoverable reserves are in the range of 80 to 130 million cubic meters. While more precise estimates may not yet be available, this substantial difference should then be reflected in the Hibernia oil production figures used throughout the EIS as key indicators of potential impacts. A point estimate of production rates is given but it is not indicated whether they are based on the low or high range of recoverable reserves. This omission should be rectified to obtain a fuller understanding of the project's impact on the economy. A more precise delineation of recoverable reserves would be even more desirable.

Despite clear instructions in the Guidelines, the proponent has not outlined the methodology and assumptions of deriving the national/global demand and supply forecasts. This key requirement requested in the guidelines is utterly neglected. Their credibility is therefore suspect. There is no rationale to explain the rapid increase in total oil consumption commencing in 1994. The proponent should be requested to supply the necessary documentation, such as alternative economic growth projections, the oil price assumption, the influence of other energy sources, conservation and any other factors

which formed the basis of the oil production and consumption forecast.

It is even more annoying to discover in consultants' reports which do not form part of the EIS, that Mobil has given explicit instructions about certain assumptions to be used in the derivation of forecasts. However, the proponent did not have the courtesy to repeat these assumptions in a public document. This action does not promote public trust and confidence in the accuracy and completeness of the EIS as a whole.

One would have assumed that from the proponent's point of view the rationale for the project is to make a profit and thus secure a reasonable return for Mobil's and other partners' shareholders. However, such an objective is not cited. Instead, we read in the Development Schedule (Volume I, p. 16) almost in a parenthetical manner that if a fiscal regime is put in place acceptable to the Hibernia partners, detailed engineering work can begin in 1986. It is implicit that the proponent has done his own cost-benefit analysis and therefore defined an 'acceptable' fiscal regime.

Whether deliberate or not, the proponent has chosen to follow the letter rather than the intent of the Guidelines. Panel members should recognize the shortcomings and request the proponent to correct these deficiencies

II. MEASURABLE SOCIAL AND ECONOMIC BENEFITS AND COSTS

Earlier it was noted that the EIS is to a large extent an effort in identifying, cataloguing and describing. Measurable social and economic benefits and costs, if they are identified at all, are not presented in a coherent and consistent analytical framework. To give some credit to the proponent, an attempt is made to list the economic impacts of the two development alternatives (Volume I, pp. 18 - 21). This is then followed by a summary of the 'development benefits' on pages 32 - 33. Panel members will recognize that these measurable impacts are derived mainly from two consultants' reports, using assumptions and engineering parameters specified by the proponent. Further constraints and assumptions are usually implicit in the models used, and additional assumptions are used to meet the specific circumstances of the client's project. The accuracy of projections and forecast are therefore not as precise as the point estimates imply. The margin of error arising from the assumptions, the dynamic economic environment (everything else is not constant) can be considerable over the long forecast time horizon. Some recognition should be given to the range of possible outcomes.

To illustrate the significance of the constraints which have been placed on the macro-economic projections, we refer you to the Informetrica consultants' report. You will note (p. 34) that the government sector of this model was constrained to a 'no policy change'. Now whether Mobil likes it or

not, both the federal and provincial governments will continue to collect taxes and royalties and make expenditures. In fact, due to increased business activity, employment and revenue-sharing from Hibernia oil, government revenues will increase. Government expenditures will also change. Increased employment will reduce the requirement for Unemployment Insurance payments. As outlined in the Atlantic Accord, provision has been made for a \$300 million joint Offshore Development Fund, which will increase expenditures. The Atlantic Accord also provides for changes in equalization payments to the provinces where oil production starts and this will alter the expenditure bases of both the federal and provincial governments.

We believe this serves to highlight that assumptions and constraints influence the outcome of a model. In this case it is too simplistic to constrain the government sector and to make the assumption that increased revenues are used only to reduce government debt.

Even though one has to recognize the shortcomings of preliminary estimates based on conceptual designs, the proponent to his credit (or his consultants) has attempted to analyse quite thoroughly the industrial and labour requirements and their timing and magnitude. You may also have noted that labour requirements are stated in person-years, which are not equivalent to jobs in the conventional sense. It would be more useful to estimate net job growth and its timing in order to be of maximum use in the educational and skill development planning process.

Nevertheless, some reservations have to be expressed concerning the broader labour market impact of Hibernia. The general assumption is that given existing levels of unemployment, internal migration and immigration of highly skilled labour, no labour shortages will be encountered. With the exception of some trades this may be a likely outcome. In fact, it may be likely and probable that expectations of employment will raise participation rates of the labour force and offset any reduction in the level of unemployment.

While output and employment impacts are reasonably detailed recognizing the limitations of the current state of preliminary conceptual designs, the treatment of inflation is extremely cursory and incomplete. We are told (Volume IV, pp. 221, 224 & 229) that Hibernia will have a marginal impact on inflation in Canada and that no attempt was made to measure the inflationary impact in Newfoundland. In 1991 Hibernia is expected to add between 0.2 and 0.3 percentage points to the inflation rate in Canada. It goes without saying that the relevant impact area for inflation is Newfoundland, given the size of direct and indirect output and employment consequences of the project. We maintain this is a major omission in the EIS and needs to be corrected. All Newfoundlanders will in one way or another feel its impact. It is not sufficient to make reference to the anticipated level of housing stock and rental accommodation in relation to anticipated demand and suggest

that no speculative increases will occur. A project of this size and duration has the potential for a greater destabilizing influence. As a minimum we recommend to the Panel that the proponent be asked to commission case studies on inflation in comparable situations such as Hibernia and Newfoundland. We recognize the potential benefits which may accrue from the project, but we also feel the public is entitled to a full and complete exploration of the costs. Inflation is one of them, and an important one which affects us all.

III. IMPACT ON THE FISHING INDUSTRY

The use of conjecture in coming to grips with the social and economic benefits and costs is not uncommon in the EIS. It is probably most evident in the chapter dealing with the impacts on the fishery. Without attempting to misrepresent the contents of the chapter, one may conclude that there will be problems but they are minor and can easily be overcome. This overall message is strongly conveyed by the proponent.

Panel members will note that the few benefits listed are non-quantifiable and are intangible in nature. They are limited to 'better and more' information which may be of use to the fishing industry. When it comes to measurable impacts and costs, conjecture is commonly employed to allay any fears,

and it is suggested that co-operation, communication and contingency plans can deal with them. In exceptional circumstances related to attributable and non-attributable damage, compensation would be triggered.

Overall the proponent conveys the impression that Hibernia has a neutral impact on the fishing industry. However, when the component impact areas contained in the chapter are aggregated, that apparent neutrality disappears. Congestion, interference, displacement of inshore and offshore fishing areas are by no means neutral impacts. Neither is the risk of an oil spill at the project site or inshore, even though the probability of such spill is very low. However, in the event of a major spill, the worst scenario would be the tainting of Newfoundland's fish in its major markets. Such a possibility, although remote, would constitute a severe setback for the fishing industry and the Newfoundland economy.

It is also very likely that other discoveries will move from exploration to development and production. The consequences for the fishing industry will be cumulative, creating unease that the detrimental impacts will magnify and cause serious dislocation.

The suggestion that tainting of fish is not expected to occur is no great consolation. Similarly, it is naive to propose that government taste panels could counter effectively the perceptions in the national and international marketplace that Newfoundland fish products may be less desirable as a

result of an oil spill. Such taste panels could not exercise the necessary control. Competitors could easily argue that their products are of superior quality. Initially, market resistance may be limited to price differentials, which would transmit eventually to the harvesting sector. More serious consequences could result in a permanent loss of markets. The problem of compensation for temporary and permanent losses throughout the Newfoundland fishery is significant. Public policy must address these contingencies of direct and induced losses arising from oil-related causes.

The Fishermen's Compensation Policy for non-attributable damage is a positive development but remains to be tested. This policy and claim procedures will also guide the development of compensation for attributable damage related to Mobil's activity inshore and offshore. From the fishermen's perspective it is immaterial whether the damage incurred is attributable or not. He wants compensation for losses incurred whether or not the operator can be identified. It is therefore suggested for reasons of access, administrative ease and consistent application of claims that attributable and non-attributable claims be dealt with by one Compensation Board. Under this proposal, the fisherman would have one window for his claims and the Board would have the responsibility of deciding whether the claim is attributable or not. In most cases this would be relatively easy, given the documentation of the claim. Attribution would be an internal matter of the Compensation Board.



NEWFOUNDLAND ASSOCIATION OF SOCIAL WORKERS

P.O. BOX 5244,

ST. JOHN'S, NEWFOUNDLAND

AIC 5W

August 6, 1985

Hibernia Environmental
Assessment Panel,
P. O. Box 1505,
Station "C",
St. John's, Nfld.,
AIC 5N8

Dear Chairperson,

The Newfoundland Association of Social Workers would like to comment on a major deficiency of the Environmental Impact Statement. The authors of the statement appear to feel that identification of problems or benefits completes their tasks. The measurement of these costs and benefits is what this Association had assumed to be the mandate of the Environmental Impact Statement.

The situation is made worse by the fact that the Statement, when confronted by a lack of information of social services, simply documents this fact and seems to feel their task is complete. The last sentence of section 2.7.1. Volume IV illustrates this failing. "Agencies involved in social services have been unable to provide much information on the extent of existing social problems or the demand for social services." The Newfoundland Association of Social Workers contends that the Environmental Impact Statement must obtain this information and complete the necessary assessment before dismissing this impact area.

The Statement introduces section 5.1 on Residual Impacts with the disclaimer that some impacts are unavoidable, some can only be partially addressed and finally some impacts are not significant. In section 5.1.6 Social Services and Community Infrastructure, the authors state that they expect no significant

problems. We do not feel that such a deduction can reasonably be made without knowing the extent of social problems or the demand for social services.

We trust these issues will be addressed by the Panel in the near future.

Sincerely yours,

Joe Coombes

Joe Coombes,
Social Policy and Planning Committee, N.A.S.W.

Maureen E. Browne

Maureen Browne,
President,
Newfoundland Association of Social Workers.

COMMUNITY SERVICES COUNCIL

NEWFOUNDLAND AND LABRADOR

21 FACTORY LANE

ST. JOHN'S, NEWFOUNDLAND

P.O. BOX 5116, A1C 5V3 TEL (709) 753-9860

August 9, 1985

Hibernia Environmental Assessment Panel
243 Duckworth Street
St. John's, Newfoundland
A1C 5N8

Dear Panel Members,

Enclosed, please find the Community Services Council's assessment of the Mobil Oil Canada Environmental Impact Statement, regarding areas of deficiency.

The Council will provide a more detailed analysis of the EIS in its brief to the Panel in the Fall.

Thank you for your considerations.

Yours truly,



Marie Hedderson
Information Officer

MH/djs

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Lieutenant Governor of Newfoundland

COMMENTS RE: DEFICIENCIES

HIBERNIA ENVIRONMENTAL IMPACT STATEMENT

COMMUNITY SERVICES COUNCIL OF NEWFOUNDLAND AND LABRADOR
VIRGINIA PARK PLAZA
PO BOX 5116, Station "C"
St. John's, Newfoundland
A1C 5V3

Tel: 709 753 9860

August, 1985

EIS DEFICIENCIES

The Community Services Council of Newfoundland and Labrador is a social planning and research agency. Our main interests have centred around social and community concerns, and therefore, our comments regarding the environment are restricted to the human environment. As the Council has no expertise in ecological and biophysical issues, we are trusting that other community based groups whose focuses are in these areas will assess the document for these considerations.

The following is a list of areas in which the Community Services Council finds the social and community oriented sections of the Environmental Impact Statement deficient. Accompanying each is a short explanation, and where possible, a reference to the document. Comments, for reasons noted above, will centre on Volume IV of the Environmental Impact Statement.

1. The objectives of Volume IV are listed on page 2 of the document. Two of Mobil's stated objectives in compiling this particular volume have not been achieved.

- (a) The first of these is to

"Provide a baseline of socio-economic information for Newfoundland, sufficient to allow an assessment of impacts from Hibernia development."

This objective is also listed as a requirement by the provincial government in Guidelines for the Approval of a Hibernia Development Program, submitted to Mobil Oil Canada Limited, July 1981, p. 11. However, a baseline of information is not provided sufficient to discuss impacts. The document does not have sufficient baseline information generated for social services in its background document, and this is recognized throughout by IDP Consultants who compiled the social services background report:

"The lack of detailed baseline information, and the lack of information on planned future services meant that the analysis of potential impacts focussed more on issues of concern than facts." Background Report, The Impact of Hibernia Development on Community Services and Social Infrastructure in Newfoundland, Vol. II, p. 5-3

"The baseline section was constrained by both a lack of available data and the quality of that information." Ibid, p. 5-4

"... the data available on the extent of social problems and the effectiveness of the present social service delivery system in dealing with them are limited. This makes it difficult to forecast with precision the extent to which future social services are needed, and the resulting incremental demand for services which might arise from the Hibernia project." Ibid, pp. 5-63-64

Further to this, the Social Services background study recommends as a mitigative measure:

"Additional research should be undertaken or sponsored by the federal and provincial governments to identify present needs and future service requirements." Ibid, p. 5-107

It is clearly indicated throughout that the lack of baseline data has severely constrained an assessment of how the Hibernia development will impact on the social service sector.

(b) The other objective of Volume IV which has not been fulfilled is as follows:

"Outline procedures to monitor project-related impacts on the human environment to allow for early identification of Hibernia related socio-economic issues." This particular objective is discussed on p. 338 of Volume IV.

A single paragraph discusses the entire outline of procedures on monitoring and these procedures are obviously not dealt with in adequate detail. Reference is made to:

"a mechanism ... to pull together these monitoring efforts,"

(these monitoring efforts referring to federal and provincial governments' efforts) and to the establishment of a monitoring body. However, neither of these is fully explained, nor are any procedures outlined for the establishment and operation of such entities.

2. Employment projections are very important in determining impacts on social services and housing. Any discussion of such impacts depends on the demographic projections, and the Environmental Impact Statement is inhibited in its exploration and discussion of its employment figures. The document does not allow for a range of possible employment levels, and appears to contend that the entire project will run smoothly, as planned, and there will be no need for additional employment. However, experience elsewhere shows that employment figures on such projects have been underestimated by as much as 400%. In the case of Sullom Voe Environmental Impact Statement, Shetland and the Condeep Platform Yard in Stavanger, Norway, one important factor which accounted for a dramatic underestimation of employment requirements was weather conditions which caused delays and added work on the project.

It is a major flaw in the EIS that such possibilities were not taken into account, particularly as they had been experienced elsewhere, and particularly as well because such changes in employment estimation may seriously change the outlook in areas of social services and housing.

Another indication the EIS is remiss in not discussing a range of employment figures, is in its recognition of possible changes. On pp. 166, 168, and 172 of Volume IV, employment requirements tables are accompanied by the following caution,

"These preliminary employment estimates are based on conceptual designs only and may vary substantially once detailed engineering is completed."

This cautionary note is not discussed in the body of the document, yet it would seem likely that if the labour figures changed substantially then the impacts on housing and social services would also change substantially.

3. The document is also deficient in that it does not include an impact assessment for the Burin area. The Marystown shipyard will likely be used for Hibernia related activity. The EIS is once again limited because there is one assumption here - that is that the existing shipyard facility and the present unemployed labour force can cope with any demands resulting from Hibernia related activity. Again there is no exploration of the possibility of actual labour figures being substantially different from those forecast, yet the cautionary note accompanying the tables indicates they may be. Therefore, should they increase substantially, the Burin area would certainly experience significant impacts. Since,

"By necessity the EIS is based on a series of assumptions which are likely to change as the development evolves", Vol. I, p. 3

such likelihood should be addressed by the document and a range of possibilities explored. One such likely possibility is significant activity at the Marystown shipyard which would impact on the Burin area. The Environmental Impact Statement is certainly remiss in not exploring such a significant probability, especially considering previous experience elsewhere as cited (Sullom Voe Environmental Impact Statement, Shetland and the Condeep Platform Yard in Stavanger, Norway) where peak employment was underestimated by as much as 400%.

4. According to the EIS, work camps will be used to house many of the construction workers at Argentia and Come By Chance. This measure supposedly, will mitigate against negative impacts on housing and the human environment of the outlying communities. However, despite the fact that these work camps are an integral part of the

company's plan to alleviate stress in the two very important areas of social services and housing, they are not discussed adequately in the document. There is no detailed description of how they will be designed, and where they will be located, how they will protect communities from impacts, or how they may be able to adapt if the impacts are greater than the EIS anticipates.

It is important to note here that while the work camps are mentioned as an important mitigating factor, the Background Report on Social Services cautions that such work camps may contribute to social problems.

"In other areas of the province where similar work camp environments were in place, e.g. Stephenville, there was an increase in unwed mothers." Vol. II, p. 5-102

Information such as this is not pulled together and discussed. All sections and issues are discussed in isolation, hence it is a concern that, as pointed out in the foregoing example, the various aspects of the project impacts are not taken into consideration as to how they may interrelate, and thereby cause complications which are not presently anticipated by the document.

5. A major deficiency of the EIS is that it recognizes only one possible scenario or one possible series of assumptions, and one conclusion for each area of possible impact. The document should have recognized a variety of possibilities, for example more construction of project requirements taking place in Newfoundland. It is obvious from the document that other possibilities exist, but we are not made aware of them.

6. The Environmental Impact Statement is severely limited in its assessment of possible housing impacts. Its limitations are outlined below.

(a) The general approach to the analysis of housing impacts is deficient, as it is restricted to Hibernia related housing. Housing is composed of many interrelated factors; the market is affected by many features so that it is impossible to take just one variable and assess it in isolation.

One very important factor is the speculation which will occur in housing resulting from Hibernia. The EIS does not take speculation into account, yet it has been a major contributing factor to housing impacts in all other areas where oil development has taken place.

(b) However, even in attempting to isolate Hibernia related demands and assess impacts in the St. John's area, the conclusion is seriously flawed.

The EIS compares Hibernia related housing needs to existing housing stock in order to assess impacts on housing. Such a comparison does not provide a clear picture of possible impacts. It leaves out the vagaries of the marketplace and it is not an appropriate comparison. To more adequately arrive at an assessment of housing impacts the Hibernia related demand must be compared to the natural increase in demand without Hibernia.* That calculation shows a 25% impact in the peak year, 1992, in St. John's under the Fixed Production System. The range of impacts from 1986-1995 is from 2% to 25% with a general overall impact of 7%. Such impacts cannot be

* The EIS assumes the number of Hibernia households will equal 100% change in demand for dwelling units. Based on 1980-85 experience the number of households without Hibernia will equal 70% increase in demand for dwelling units. To calculate the impact of Hibernia:

assess the percentage of Hibernia households as a percentage of the predicted natural increase in demand:

$$\text{Hibernia Impact} = \frac{100\% \text{ (Hibernia households)}}{70\% \text{ (Natural increase in households)}}$$

described or manageable. Also added to this impact is the likelihood of a dramatic underestimation of the employment figures (as discussed earlier in this paper) and the speculation which will occur as a direct result of Hibernia: the already significant impacts become more significant.

(c) One of the critical areas lacking is an impact assessment on housing on the Burin Peninsula. Because there may be a great deal more employment at the Marystown shipyard, the presently unemployed pool of labour in the entire Burin area may be employed. Also, possible speculative in-migration may occur as former Newfoundlanders come back to their hometowns upon hearing of the increased activity at the shipyard. Such activity, it would appear would result in new housing construction, and possible speculation in the housing market. Because of that possibility the Environmental Impact Statement should have prepared an impact assessment for the area to determine what range of impacts may be anticipated.

(d) The EIS is also deficient in not analyzing the housing impacts in the Argentia and Come By Chance impact areas. These two rural areas, where it is anticipated that the impacts could be greater than in St. John's, are not thoroughly discussed. The EIS merely states the type of units in which people will be housed, depending on their marital status (work camps for single persons and houses or mobile homes for families) and assumes that no problems will arise.

To adequately assess the impacts on housing, the natural increase in units should be compared to the Hibernia induced increase but this cannot be accomplished as the data for natural increase for the Argentia and Come By Chance areas is not specified in either the EIS or the housing background study. However, even when comparing the quantity of existing households in the rural impact areas to the volume of new units required, it is obvious the situation

warrants much closer scrutiny. For example, in the Argentia impact area there exist 1490 housing units and under the Fixed Production System in 1989 an additional 757 households will be required.

(e) The rental market in St. John's will likely undergo much greater stress than the Environmental Impact Statement allows for. Analysis of the rental market does not consider a number of important factors. The EIS assumes housing demand and supply take place in a very ordered fashion: for example, 100 units are required, 100 are built and filled. But that is not how housing is supplied. The marketplace is a competitive one, hence as Hibernia activity increases, industry will respond, with businesses competing with one another in the supply of rental units.

The EIS does not consider how rental units come on the market. For example, they are not built one at a time. One project (one building) may see an additional 50 units, so that there is the possibility of a severe shortage one year and a big oversupply the next, the units are not filled immediately upon completion.

The EIS also assumes that rental prices will not increase because of the protection afforded tenants by the "Residential Tenancies Act". (p. 259). However, it has not been demonstrated in the past that this legislation is a safeguard from rental increases. There are a number of ways in which landlords may bypass the legislation. They may, for example, give tenants notice to vacate so they may undertake renovations. With Hibernia gearing up there may be an increase in such activity. Many landlords may decide to upgrade their properties in order to charge higher rents. The Environmental Impact Statement ignores this possible impact.

(f) An important factor in the consideration of low income housing is the possible displacement of families from cheaper housing downtown. Already older homes are being bought downtown, renovated and rented at high rental costs to young professionals. This trend may impact substantially on the supply of low income housing as Hibernia related activity increases over the next couple of years, yet this impact is ignored in the Environmental Impact Statement.

(c) The EIS is wrong in its assumption that the price of housing will not change.

"Since the housing requirement forecast for Hibernia is not expected to create substantial demand, neither land or house prices are expected to increase significantly as a direct result of development." Vol. IV, p. 258

This very important conclusion is based on a number of erroneous assumptions. Firstly it assumes that the price of housing is solely a function of demography, whereas the price of housing is more closely tied to the price of materials, the price of labour, retail real estate activity and not least of all, speculation. Speculation can be an extremely important factor in determining price. Lack of speculation in the housing market is the second erroneous assumption made in this conclusion. For the purposes of an Environmental Impact Statement the assumption of speculation should be made.

(h) Many of the assumptions upon which housing impacts analysis is based are of the nature of predicting personal decisions which individuals and families are likely to make, and are therefore not of sufficient strength on which to base sound planning and predictions of future market conditions.

The EIS assumes that everyone who works for Mobil Oil and its sub-contractors will live wherever they are told to live, and also that the company has the right to tell people where they will live and in what kinds of housing. For example, in reference to the Argentina impact area, the Environmental Impact Statement, Volume IV indicates in Section 4.7.2.2 p. 259 that

"This short growth period may mean that there is considerable difficulty in placing these families in existing housing because very few vacant houses are on the market. Since the housing requirement is for a two to three year period, the household supply could be met by placing mobile housing in existing serviced areas. This approach would eliminate the possibility of a housing supply deficiency."

This assumes the personnel will live where the company tells them to, and it also assumes that administrative or executive personnel and their families (Mobil has said that only administrative or executive personnel will bring their families to Argentina and Come By Chance and will require houses) will be willing to live in mobil homes for two to three years. The EIS also assumes that single individuals will rent apartments and that families will buy houses, and calculates the impacts on the rental and home ownership markets on that basis. However, many singles may choose to share apartments or to share houses; some small families may choose to rent. There are a variety of options available which may significantly differ from these EIS assumptions.

In conclusion, the Environmental Impact Statement is an inadequate barometer of impacts from the Hibernia project. In social services the baseline data is not generated to allow for an adequate assessment of present services, hence a projection of future needs cannot be made. It does not appropriately outline mitigative measures such as a comprehensive monitoring system. It leaves out an important area (Burin area) which may be seriously impacted. It does not assess the possibility of more than one project scenario with a range of projected impacts. It does not take possible underestimation of employment requirements into consideration. In the area of housing it does not provide an analysis of housing markets or an impact assessment for Argentina and Come By Chance. The impact assessment for St. John's is limited to only direct Hibernia related housing requirements. The impacts are erroneously calculated on the basis of existing housing stock rather than on the basis of the natural increase in demand without Hibernia. Speculation in the housing market is ignored, and conclusions are drawn from false assumptions.



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Metro Place, Kenmount Road

File No.: 94-8-8

August 5, 1985

Hibernia Environmental Assessment Panel
345 Duckworth Street
St. John's, Newfoundland
A1C 5N8


Dear Sir/Madam:

On behalf of the St. John's Metropolitan Area Board, I am pleased to submit these Comments and Questions on the Hibernia Environmental Impact Statement for your consideration.

I thank you for your assistance in accommodating our need for additional time and for your co-operation.

Your response to the Comments and Questions contained herein would be appreciated.

Respectfully submitted,
ST. JOHN'S METROPOLITAN AREA BOARD


John R. O'Dea
Chairman

Encl.

JRO'D/dm

Comments & Questions
HIBERNIA ENVIRONMENTAL IMPACT STATEMENT

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A.1 Introduction

The St. John's Metropolitan Area Board has prepared this document in response to the Hibernia Development Project, Environmental Impact Statement as presented to the Government of Newfoundland and Labrador and Government of Canada, May 1985. Though not intending to discount the importance of the Biophysical Assessment and Projection Description, it specifically deals with Volume IV, the Socio-Economic Assessment. The projections and requirements outlined in this Assessment will undoubtedly have the greatest impact on the St. John's Metropolitan Area and adjacent municipalities. Therefore, this document deals with the St. John's Impact Area only.

In this context, this document has been prepared to include the following:

1. An overview of the St. John's Metropolitan Area.
2. Comments on the Assessment review process.
3. Employment Impact.
4. Demographic Impact.
5. Housing Impact.
6. Municipal Government and Finance.
7. Land and Infrastructure.
8. Community Services and Social Infrastructure.
9. Notes.

B.1 The St. John's Metropolitan Area

Presently, the St. John's Metropolitan Area Board has jurisdiction over 86,538 hectares, encompassing urban and rural lands (see Map 1). There are ten communities under the Board's jurisdiction, two of which are provided with a full range of municipal services. In addition, two development areas, Eastmeadows and Elizabeth Park, receive a full range of services. The Board also provides a range of services and functions throughout the Metropolitan Area reflecting its regional and local role as well as recognizing the urban/rural dichotomy within the St. John's Urban Region.

In terms of regional functions, the Board is responsible for thirteen existing or proposed watersheds in the region, as well as for the operation of the Bay Bulls-Big Pond Water Supply. This system presently serves approximately 50,000 residents and is capable of meeting the future requirements of the Northeast Avalon for at least two decades.¹

The Board's 1982 population was estimated at 16,137,² representing 9.3% of the Region's population. The 1984 estimated population is 17,034,³ representing a per annum increase of 1.8%.

The Metropolitan Area's location, on the Northeast Avalon in close proximity to the Hibernia Oil Field, places it in a position to be greatly affected by offshore development. The Area contains a substantial amount of coastline, some of which is suitable for offshore supply bases. Freshwater Bay has been designated by the Provincial Government for on-shore petroleum related development under the Development Areas (Lands) Act. An offshore base has been proposed for the Area and the proponent has

been directed to prepare an Environmental Impact Statement on its proposal. In addition, lands at Bay Bulls and Octagon Pond have been designated for on-shore petroleum related development under this Act. Bay Bulls is completely within the Board's jurisdiction, while the Octagon Pond Development Area is partially within its jurisdiction.

In terms of land area, the St. John's Metropolitan Area is the largest Municipality in the Province. Its boundaries are contiguous with all other municipalities in the Northeast Avalon, including the City of St. John's. Consequently, development pressures within the City, for residential, commercial or industrial lands, may readily spill-over into the Metropolitan Area. Fortunately, the Board has always taken a planned approach to land use and development. It has approved or is in the process of preparing Development Schemes or detailed plans for most areas under its jurisdiction. In addition, it has prepared a number of Rural Development Schemes and Resource Development Schemes for areas under its jurisdiction.

The Metropolitan Area is extremely diverse in nature. Within its boundaries are highly urbanized areas, adjacent to the City of St. John's and Town of Mount Pearl, rural communities and large tracts of rural land. Further, the area contains a substantial amount of agricultural land. Of the approximately 19,811 hectares within the St. John's Agricultural Development Area, an estimated 65% is under the Board's jurisdiction.⁴ The Board, in conjunction with the Department of Rural, Agricultural and Northern Development, recognizes the need to preserve this land for agricultural use.

ST. JOHN'S URBAN REGION : MUNICIPAL STRUCTURE

MAP A-1

INCORPORATED MUNICIPALITY

 ST. JOHN'S METROPOLITAN AREA

 OTHER

 UNINCORPORATED AREA

 COMMUNITY WITHIN THE ST. JOHN'S METROPOLITAN AREA

 MUNICIPAL BOUNDARY

 ST. JOHN'S URBAN REGION BOUNDARY

 SCALE 1:250,000



PLANNING AND DEVELOPMENT
ST. JOHN'S METROPOLITAN AREA BOARD



C.1 Assessment Review Process

The method in which the Hibernia Environmental Impact Statement has been presented for review, has created difficulties for the Board. Essentially these difficulties stem from the scheduling of hearings and deadline for submissions.

With the conclusion of the Public Information Session on June 26, the Board has been given a mere five weeks in which to examine the Impact Statement, consult background studies and prepare its written comments and questions for the Panel's consideration. This situation has been further aggravated by the difficulty experienced in obtaining background studies for extensive examination. Though copies of the background studies were available from the Panel's office, they were available for limited time only. Consequently, analysis of these studies was severely restricted. The Board did eventually receive a full complement of background studies; however, it was not until mid-July, two weeks prior to the deadline for submission of Comments and Questions to the Review Panel.

Likewise, the Board has experienced similar difficulty in the preparation of its Brief on the validity of the Project. Briefs are to be presented by mid-September; thereby allowing approximately six weeks for research, analysis and preparation. Apart from time constraints, at this time, it is uncertain as to whether or not the Review Panel will respond to the Comments and Questions contained in this document in time for the Board to prepare its Brief.⁵ If response is not received, the Board's ability to constructively comment on the validity of the Project may be severely impaired.

Furthermore, at present, it is unclear as to whether or not Mobil's Development Plan will be released to the public. Recognizing the significance of this document, the Board urges the Assessment Review Panel to have the Provincial Government make this Plan public.

D.1. Employment Impact

The projected number of jobs to be created by the development of Hibernia provides the basis for all other estimates contained in the Environmental Impact Statement. Yet the inherent uncertainty contained in projections generally, as well as Mobil's method in arriving at and presenting its projections, leaves considerable doubt as to their reliability.

In determining the projections contained in the Environmental Impact Statement, very little original research was conducted. The document is based primarily on primary and secondary sources because "...it was not practical to obtain exhaustive description of the existing environmental and socio-economic setting."⁶ As a result, the baseline description and associated projections contained in some sections of the socio-economic Assessment are lacking in terms of content and conclusions.⁷ This point will receive further analysis in upcoming sections.

Further, when used with a degree of caution, projections are a useful planning tool. Due to the changing nature of the assumptions upon which they are based; however, they contain a probability of error. This probability is usually reduced by formulating a number of different projections. As a result, a range of possibilities, and contingency plans can be developed to deal with each scenario.

Mobil's failure to provide more than one scenario is the basic flaw contained in the Environmental Impact Statement. No margins of error are provided, nor does the Assessment provide a range of employment statistics. Consequently, to a great degree the Assessment fails in its stated purpose; to assist and facilitate planning.⁸ Further, due to the uncertainty of the employment

projections, doubt is cast on other projections based on them.

- D.2 The authors of the background study on employment used multipliers derived from development experiences in the North Sea and elsewhere to calculate the number of new jobs in Newfoundland.⁹ Given the importance of employment multipliers and their effects, Mobil should have conducted original research in Newfoundland. Moreover, throughout the public information sessions and in many sections of the Environmental Impact Statement, the similarities between the North Sea and Hibernia are downplayed.¹⁰ Therefore, the Board would like to have the accuracy of these multipliers clarified.

These multipliers were used to determine the number of new jobs to be created in Newfoundland and only new jobs were considered when assessing demographic change.¹¹ Consequently, any differences between multipliers from the North Sea and those in Newfoundland will directly affect demographic projections for the St. John's Impact Area.

- D.3 The Assessment assumes no in-migration for associated employment; this is assumed to be supplied locally given the high level of unemployment in the construction trades and service industries.¹² This assumption fails to consider the lack of skilled tradesmen in some fields and the potential establishment of new businesses, through joint ventures, to serve offshore developments. Such ventures will undoubtedly create additional jobs and result in some in-migration.

- D.4 During the past five years, 275 businesses were formed whose operations were wholly or partially related to oil and gas development.¹³ Given the fact that St. John's is the provincial centre for oil and gas exploration and

development, it is undoubtable that the vast majority of these businesses were established in the St. John's Impact Area. Yet no projections are given on the number of businesses which may be established as a result of development, on the number of jobs which these businesses may create or on the resulting immigration they may incur. The Board wishes clarification of these points with reference to the St. John's Impact Area.

E.1 Demographic Impact

According to the Impact Assessment, population increase in the St. John's Impact Area due to Hibernia development is expected to be minimal, somewhere in the vicinity of 1%¹⁴ over a twenty year period beginning in 1986. Given the problematic nature of the employment projection, upon which this population estimate is based, the accuracy of this projection is questionable. Had Mobil provided a high/low scenario, more realistic figures would be available and the Board would have been able to plan more effectively for the development of Hibernia.

E.2 A substantial number of speculative job seekers coming to Newfoundland during the development of Hibernia is assumed to be returning Newfoundlanders. These returnees should not create problems for the Board as they have homes and families to return to. Further, Mobil intends to implement mitigative measures to keep speculative in-migration to a minimum; for example, the advertisement of realistic job opportunities.¹⁵ While returning Newfoundlanders may indeed form a substantial number of job seekers, Mobil's intended mitigative measures may not be sufficient to deter many others from entering the province in search of work. This is especially true, given the substantial unemployment rates of the other Atlantic Provinces.

This situation has serious repercussions for the Metropolitan Area. With St. John's being the centre for exploration and development, undoubtedly many in-migrants will come to this area. As a result, if a high in-migration scenario occurs, the Board will have to provide services, some of which may be extremely expensive. In addition, the setting up of camper trailers in rural areas will create servicing, legal and moral difficulties for the Board. This

situation will be examined further in an upcoming section.

- E.3 Mobil recommends continuous monitoring in order to avoid or mitigate negative impacts and it will provide the necessary information regarding industrial and labour requirements to enable a monitoring agency to carry out its mandate.¹⁶ The Board supports the establishment of such a monitoring agency under the auspices of the Provincial Government; however, in reference to mitigating negative impact, it believes disturbance fees could be imposed. These fees could be a royalty or tax on production and could be used by municipalities to provide services and meet infrastructural requirements due to the development of Hibernia.
- E.4 The Hibernia Environmental Impact Statement has focused on the impacts of the development of the Hibernia Oilfield only. The cumulative effects of this development, increased exploration activity or the development of other oil fields, have not been examined. Undoubtedly, the cumulative effects of these developments could drastically affect the Metropolitan Area. Large scale immigration may occur, demands for services and expensive infrastructure may occur, low income families may be displaced, real estate prices and apartment rentals may skyrocket and many other negative impacts may be experienced.

During the Public Information Sessions, as well as in the Environmental Impact Statement, Mobil officials recommended the establishment of a joint monitoring agency, consisting of representatives of the Federal and Provincial Government, to monitor the cumulative effects of off-shore development.¹⁷ As noted, the Board supports the establishment of such an agency; however, it feels the agency should be established immediately in order to be in place for when full scale development occurs.

F.1 Housing Impact

The way in which Mobil has prepared and presented its employment projections, i.e. lack of original research and the absence of more than one scenario; has created difficulties in analyzing increased housing demand as a result of the development. Had Mobil provided scenarios, high/low, the Board would have been better equipped to plan for the development. Due to this problem, continuous monitoring will be required and the public should be informed of all pertinent changes immediately.

F.2 Recent experiences with the exploration stages of off-shore development in the St. John's Impact Area have shown the dramatic impact such development can have on housing in the St. John's market. The rapid increases in real estate prices in 1979/1980 and the artificial increase in the rental market due to the influx of Mobil staff in late 1983/early 1984 are indicative of this impact. Consequently, all announcements related to development and all staff transfers should be properly planned. Staff transfers should be phased in gradually as they can be gradually absorbed by the housing market, thereby eliminating supply shortages and rental increases. Further, when a large influx is expected, developers, real estate agents and municipalities should be informed to enable them to be prepared.

F.3 A basic assumption of the housing component is that single employees will rent apartments, while families will purchase dwellings.¹⁸ Given the low apartment vacancy rates in the St. John's area and the relatively limited supply, any increase in demand will create shortages and corresponding rental increases. With the uncertainty of the employment projections, such supply constraints are quite possible.

- F.4 Displacement of low income individuals and families is a realistic possibility associated with the development of Hibernia. Supply problems already exist as indicated by waiting lists for nonprofit and public housing. Consequently, any increased demand will cause affordability problems for low income groups and displacement will occur. Therefore the Panel should impress upon the Provincial Government the need for immediate action to ensure that low income groups will be taken care of.
- F.5 A corollary of F.4, at present there is a shortage of low income and special needs housing. Speculative in-migration and transients workers associated with Hibernia development will aggravate this situation for they too will require inexpensive housing. Mobil's mitigative measures to deal with speculative in-migration may not be sufficient. Moreso, increased demands for other types of housing may cause special needs and low income housing to be neglected.
- F.6 Housing for in-migrants and transients is of major concern to the Board. If speculative in-migrants are unable to find affordable housing, they may seek out social housing. Given the present situation with social housing, where demand is greater than supply, the same in-migrants may be forced to seek alternate sources of shelter, namely mobile homes and camping trailers.

During the construction of the Come-by-Chance Oil Refinery it was not uncommon to find camping trailers set up in gravel pits and along roadsides, being used as temporary accommodations. Such situations are not acceptable from health and aesthetic points of view. Given the large tracts of rural land under the Board's jurisdiction, including numerous gravel pits, the

Metropolitan Area would provide ideal locations for such use. Further, this situation may lead to the establishment of temporary squatter camps, where simple shacks, without sanitary services, are used for accommodation. Such illegal uses would not be tolerated by the Board; however, with a large influx, its manpower and financial resources would be severely strained to control such developments.

F.7 Further, the background study on housing makes no reference to the use of mobile homes in the St. John's Impact Area.¹⁹ Given the temporary nature of many of the jobs associated with off-shore development, they become a viable form of accommodation, relatively cheap and moveable. At present, there are four mobile home parks in the St. John's area: two are located in the City of St. John's, one is located in the Goulds and the other is in the Metropolitan Area. The one in the Metropolitan Area, Evergreen Village, contains 175 trailer lots of which approximately 165 are presently utilized.²⁰ The potential shortage of such lots may force individuals to locate their trailers on vacant land. Although such moves are against the Board's Development Regulations, servicing and legal problems would ensue if a substantial number of individuals were to place their trailers on vacant land.

Given the temporary nature of many employment positions and the validity of using this form of accommodation, the Board would appreciate information on the projected number of workers who might wish to use mobile homes. This would enable it to plan for more parks if need be, thereby removing the possibility of having mobile homes scattered all over the Metropolitan Area, instead of where they can be effectively serviced.

G.1 Municipal Government and Finance

According to the Impact Statement, of the three Impact areas, the St. John's Impact Area is best prepared to deal with off-shore development. This is attributed to the planning and financial capabilities of the City of St. John's, the Town of Mount Pearl and the St. John's Metropolitan Area.²¹

In contrast, smaller municipalities and unincorporated areas within the Impact Area are less well prepared for off-shore development. Elected officials in many municipalities have limited experience with self-government and many municipalities lack the tax base or fiscal resources to implement needed improvements. Likewise, although many municipalities have approved plans, they do not have the resources to implement these plans, nor to enforce development regulations.

G.2 Given the financial constraints and associated problems of some municipalities within the St. John's Impact Area, the Hibernia Assessment Panel should make representation to the Provincial Government to ensure that these municipalities are able to cope with increased development pressures resulting from the development of Hibernia. This could be achieved through revenue sharing between municipalities or the establishment of a municipal development fund.

The St. John's Metropolitan Area Board supports establishment of a development fund. This fund would enable municipalities to properly plan and implement infra-structural improvements required to meet increased demands resulting from the development of Hibernia.

The disturbance fee, noted earlier, could be incorporated into this fund.

- G.3 The Impact Assessment recognizes the need for a regional authority in the St. John's Impact Area, to provide regional services and to co-ordinate planning on a regional basis. Elsewhere in the province some of these functions are provided by regional development associations;²² however, such associations have not been formed in the St. John's Area. The Board recognizes the need for the establishment of a regional authority and has made representation to the Provincial Government on this matter on numerous occasions. In addition, this authority could be responsible for administering the municipal development fund noted above.
- G.4 In the background study on Municipal Government and Finances, the analysis of municipal financial capability was severely limited. Of the sixteen municipalities within the St. John's Impact Area, analysis of municipal financial capability was restricted to six, St. John's, Mount Pearl, St. Thomas, Portugal Cove, Conception Bay South and the St. John's Metropolitan Area.²³ Although, these municipalities comprise 86% of the area's population,²⁴ the exclusion of the other ten municipalities places the conclusion of the analysis on municipal financial capability in the Impact Area in doubt.
- G.5 Within the St. John's Impact Area, the Assessment has determined that St. John's and Mount Pearl, where demands from the project are expected to be felt strongest, could absorb increased demands without a disruption in service.²⁵ The only infrastructural improvement identified involved highway and road improvements in the harbour area of St. John's, where problems currently exists. The development of Hibernia may aggravate these problems. Moreover, it is beyond the fiscal capability of the City to implement the required improvements. Therefore, the Assessment recommends the involvement of

three levels of government and add that money from the Development Fund of the Atlantic Accord be used to begin improvements immediately.²⁶ The Board supports this recommendation. In addition, financial assistance from the Development Fund of the Atlantic Accord should be used to improve highways in the greater St. John's Area as well.

H.1 Land and Infrastructure

Like most aspects dealt with in the Assessment, land and infrastructure requirements resulting from the development are expected to be minimal. Once more these findings are based on employment and demographic projections. These projections have enabled the Assessment authors to determine that:

1. existing capacity in water, sewer and waste disposal facilities is capable of meeting expected demand and increases are "not expected to strain services";²⁷
2. additional hotel facilities will not be required as projected demand will fill existing vacancies;²⁸
3. there is sufficient vacant warehouse to meet expected requirements and additional space can be readily constructed;²⁹
4. existing vacant office space will meet projected requirements;³⁰ and
5. sufficient commercial and industrial lands exist to meet expected requirements.³¹

In contrast, the Assessment recognizes the need for some infrastructure improvements; improvements which would have to be made regardless of whether or not Hibernia is developed.³² Necessary improvements to streets and roads in St. John's have been noted. More specific improvements include the East End Arterial, truck routes, and better access to the Southside Road. Additional infrastructural requirements include hangars and apron space at the Torbay Airport and dock side backup lands at the harbour

In addition, several points noted earlier need to be reiterated as they may affect land and infrastructure

requirements in the Metropolitan Area. These include:

- 1) the cumulative effects of all oil exploration and developments should be examined to determine if there is a need for additional land, services and infrastructure;
- 2) Mobil's employment and demographic projection should be updated as soon as the development plan is released in order to plan for a potential increase in demand; and
- 3) the Assessment should deal more effectively with employment multipliers associated with the establishment of off-shore service companies, and their requirements for land and infrastructure.

Each of these points has the potential to dramatically affect land and infrastructure requirements in the Impact Area. They require re-examination or close monitoring and this should be conducted immediately.

I.1 Community Services and Social Infrastructure

To determine the impact on community services and social infrastructure, the Assessments' authors used information from the employment, labour and demographic studies and public agencies. In terms of public agencies, over 500 people were contacted to find all available information which could be used to predict potential Impacts. Despite this effort, little existing information could be found on existing social problems.³³ and although this created a necessary situation for original research, none was conducted.

This lack of concrete data creates a potentially serious situation for the greatest impact resulting from the development of Hibernia will be on the field of community service and social infrastructure. This system, as it currently exists, is already overtaxed and any additional increase will only further aggravate the situation. These problems encompass a number of areas and Mobile's mitigative measures may be unable to deal with this effectively.

I.2 In some medical specialist areas, shortages currently exist, both in terms of staff and facilities.³⁴

Consequently, increased demand will only add to existing problems. It is the Board's position, that Mobile should consider establishing medical facilities for use of its own employees; especially facilities dealing with off-shore or underwater related disorders, for example, hyperbaric facilities. This would reduce pressures on existing facilities in the Impact Area, as well as provide new services.

I.3 A corollary of I.2, at present there is also a shortage of specialized professional and community based services

in the area of alcohol and drug abuse.³⁵ These problems are currently aggravated by high unemployment rates; however, high employment levels due to Hibernia could further intensify these problems. Occupational stress, family and community change and the work patterns associated with off-shore employment may lead to increased abuse.³⁶ Therefore, would Mobil establish facilities for its own employees to deal with these problems? Such facilities should include professional clinical facilities, as well as community based services.

I.4 As noted, the social service delivery system is presently overtaxed and is extremely limited in terms of services for women, children and ex-psychiatric patients. Even assuming relatively small population growth, the rapid community change associated with off-shore development will only intensify this situation. If population change is rapid and large, the system could conceivably collapse under pressure. Therefore, would Mobile consider providing social services to its employees and their families? Such services should include counselling services and day care facilities. These could be incorporated into a facility dealing with medical and social problems.

I.5 Speculative in-migrants and transients will be in the greatest need of social services, and the existing system may be unable to provide adequate levels of service. Therefore, Mobil should be encouraged to provide technical, financial and other assistance to community based organizations to enable them to assist in-migrants. The disturbance fees and municipal development funds noted earlier could also be used to assist these organizations, as well as financial assistance from the Provincial Government.

NOTES

- (1) Estimated population served, Engineering and Public Works, St. John's Metropolitan Area Board, July, 1985.
- (2) Department of Municipal Affairs; Population has been adjusted to reflect municipal boundary adjustments.
- (3) Estimated population, Planning and Development, St. John's Metropolitan Area Board, July, 1985.
- (4) Department of Rural, Agricultural and Northern Development, July 1985.
- (5) Conversation with Ms. B. Hill, Hibernia Environmental Assessment Panel, July 1985.
- (6) Mobil Oil Canada, Hibernia Development Project, Environmental Impact Statement, Vol. I, Summary, May 1985, p. 4.
- (7) This comment is in specific reference to employment multipliers (see Section 4.5.1) and community services and social infrastructure (see Section 4.9.1). Both aspects are further dealt with in upcoming sections.
- (8) Assessment, op cit, Vol. 1, P. 3.
- (9) Mobil Oil Canada, Hibernia Development Project, Environmental Impact Statement, Vol. IV, Socio-Economic Assessment, May 1985, P. 233.
- (10) Assessment, op. cit., Vol. I, p. 65 and Vol IV, p. 176 - 177.
- (11) Assessment, op. cit., Vol. IV, p. 233.
- (12) Ibid., p. 377.
- (13) Ibid., p. 26.

- (14) Ibid., p. 236
- (15) Ibid., p. 245
- (16) Ibid., p. 245
- (17) Ibid., p. 338; and Hibernia Environmental Assessment Panel, Information Sessions, St. John's, Volume 8, p. 664
- (18) Ibid., p. 257
- (19) See. Consult Associates Ltd, Implications of the proposed Hibernia Project on Housing, St. John's, October 1984, Revised April 1985.
- (20) Estimate based on 1981 Census, Planning and Development, St. John's Metropolitan Area Board, July, 1985.
- (21) Ibid., p. 325
- (22) Ibid., p. 152
- (23) Consult Associates Ltd., Municipal Government and Finances, Update, St. John's, October 1984, Revised April 1985. P. 74.
- (24) Statistic Canada, Census of Canada 1981.
- (25) Housing, op. cit., p. 74.
- (26) Assent, op, cit., Volume IV, p. 326.
- (27) Ibid., p. 274.
- (28) Ibid., p. 274.
- (29) Ibid., p. 274.
- (30) Ibid., p. 274
- (31) Ibid., p. 275
- (32) Ibid., p. 326
- (33) Assessment, op. cit., volume 1, p. 7.
- (34) Assessment, op. cit., volume 1V, p. 288.
- (35) Ibid., p. 290

July 29, 1985

Hibernia Environmental
Assessment Panel
c/o Bonnie Hill
345 Duckworth Street
St. John's, NF
A1C 1H6

Dear Miss Hill:

We are writing to the Hibernia Environmental Assessment Panel to voice our comments and concerns for our community of Spanish Room. We understand there is a Public Hearing August 1, 1985 and request a postponement with the Environmental Impact Statement Public Hearing in September to give us ample time to have a proper Environmental Impact study completed.

We the elected body of the Spanish Room Residents Committee would like to express our comments and concerns for our community. While our community possesses some very valuable real estate, such as the Cow Head Project now under construction, and the potential development of Spanish Room Point. The problems being experienced by the residents are as follows: due to the delay in the Cow Head access road that was promised to us before the development of the project, it has caused major concerns and problems in our community with our existing road. These problems have been stated in our letter to Premier Brian Peckford; Joe Price, MP; and to the Editor of the Southern Gazette, and also letters and phone calls to the Minister of Transportation, Ron Dawe, Glen Tobin, MHA, and everyone concerned. Enclosed is a copy of one of our letters and petitions. For example our existing road was not designed or constructed for this purpose and cannot be made so, and as a result of the heavy trucking of many tons of rock, sand, steel, cement etc. have caused considerable damage to the road and to private property, also the safety of the people, especially the school children, has been jeopardized.

As an elected body to supervise the affairs of the community the powers that be do not seem to recognize us or seem to willing to recognize us. For example, union or un-unionized groups do not consider the unemployed people of our community as first priority for the job openings etc.

The problem of health, and the standard of living has also been affected during excavation of the Cow Head Site, plus the constant noise of construction has put an abrupt end to the peacefulness for some in our area without compensation.

We would like to point out that we do not oppose development or progress for our area, but would like to have some future input into development.

Hibernia Environmental
Assessment Panel
c/o Bonnie Hill
St. John's, NF
July 29, 1985
Page 2

Our committee has applied to government for funding for an Environmental Impact study and to this date has received no reply. Our hopes were to start our Environmental Impact study on July 22, 1985 but haven't received any response. We are writing to request a delay in your September hearings because we feel we would not have sufficient time to do a proper Environmental Impact study for our area.

Thank you for your consideration and time, hoping to hear a reply from our request as soon as possible.

Sincerely,

Gordon Brake

Gordon Brake
on behalf of the
Spanish Room Residents'
Committee

/gh
cc
Enclosures

Begin Cow Head access road, group tells government

Dear Editor

Enclosed is a copy of a letter which we sent to Premier Brian Peckford. We would very much appreciate it if you would print a copy of this in the next edition of your paper.

Dear Premier Peckford, as you are well aware, the Cow Head Oil Rig Facility has been under construction since the fall of 1984. Access to this heavy industrial site is through the community of Spanish Room.

Construction of the facility has required the use of heavy trucks and equipment, and the transportation of many tons of fill, cement, steel and other products to the site.

Since 1984 and before the project began, the local government promised the residents of Spanish Room that an access road would be built from the Burnt Peninsula Highway, directly to the project site. Today the project is more than half completed and still no access is possible over the Spanish Room road.

Although construction of the rig facility is expected to be completed by the end of this year, the access road will still be desperately needed when the facility is in operation. Increased traffic, heavy materials and heavy equipment

will continue to be needed at the site.

The existing road was not designed or constructed for this purpose and cannot be made suitable as an access road to such a heavy industrial site. Along with problems of noise pollution and increased traffic, the current industrial use of the road makes it very unsafe for children and other community residents.

On January 9th, 1985 our MHA Glenn Tobin wrote the Honorable Ron Dawe, Minister of Transportation, on our behalf. He stated: "The residents are aware of your Department's intention to construct a new highway to the area of Cow Head and will appreciate it if work could start on this as soon as possible."

To date no reply has been received from the Minister.

We would appreciate it, sir, if you would take up this urgent matter and ensure that this road begins immediately.

Enclosed is a petition in support of this request. The petition is signed by 106 out of the 106 adult residents in the community.

We anticipate a positive response soon.

Sincerely,
Gordon Brake
Spanish Room
Residents' Committee

We the undersigned residents of Spanish Room request the immediate start of the promised access road to the Cow Head Oil Rig Facility and Potential Development site in the vicinity. We are displeased with the usage of the existing road for heavy traffic presently taking place, to the current development at Cow Head.

Elizabeth Brake

Ambrose Brake

John Saint

Hilda Saint

Lucille Brake

Paul Brake

Brian Keating

Francis Gaulton

Bernadine Keating

Corsine Gaulton

Glenda Gaulton

G. Gaulton

A. Gaulton

Patricia Power

Brandon Power

Judy Power

Monica Power

Neely Power

Jack Power

Theresa Power

We the undersigned residents of Spanish Room request the immediate start of the promised access road to the Cow Head Oil Rig Facility and Potential Development site in the vicinity. We are displeased with the usage of the existing road for heavy traffic presently taking place, to the current development at Cow Head.

Keri Kelly

Jeffrey Coady

George Kelly

Wanda Kelly

Eugene Devereaux

Annie Kelly

Richard Doherty

Mary Ann Walsh

Bernard Poon

Frank Doherty

Dominic Walsh

Wayne Kelly

Shane Doherty

Elizabeth Devereaux

Christina Holloway

Cathy Devereaux

Leonard Miller

Patricia Holloway

Don Devereaux

Robert Smith

John Holloway

Bridget Pike

Linda Smith

Rebecca Holloway

John T. Pike

Robert Hurley

Natalie Turner

Ignatius Pike

Gene Hurley

Linda Turner

Jack Kelly

Katherine Devereaux

Cecil Kelly

We the undersigned residents of Spanish Room request the immediate start of the promised access road to the Cow Head Oil Rig Facility and Potential Development site in the vicinity. We are displeased with the usage of the existing road for heavy traffic presently taking place, to the current development at Cow Head.

~~James L. Pike~~ L.B.

Bern Hannam

Martha Pike

Vincent Brake

Christina Hannam

Joe Pike

Ignatius Murphy

Laura Farrell

Bessie Brake

Josephine Pike

Fergus Farrell

Eva Brake

Lara Pike

Marion Hober

Leonard Brake

Peter Pike

Thomas Hober

Corrie Brake

Levy Brown

Al Stapleton

Kelth Brown

Charles Stapleton

Wile Woods

Patrick Power

Simon Woods

Pat Power

Joseph Ward

Betty Dolan

Carmelita Ward

Richard J. Parker

File 79, Box 20

St. John's Nfld

L1K5H4

July 31, 1985

Hibernia Environmental Assessment Review Office
345 Duckworth Street
St. John's Nfld

In regard to Mobil Oil's Environmental Impact Statement, I wish to make some comments. My comments, however, are not restricted to the Hibernia development, but in that Hibernia is part of our global system, my comments are applicable to Hibernia. My comments will not be as detailed as I would wish, because of your imposed deadline of August 1, 1985. Also, the offer by government of 50,000 to be divided among groups who wish to make statement on EIS, can do nothing more than a joke compared to the multi-billion dollar cost of the development, based on my assessment of the potential environmental impact of future oil development.

When one considers the benefit of removing oil from the earth, the list of benefits is quite long, including jobs, profits, research, energy supplies for our cars, industry, electric generating plants, and the many thousands of plastic and petrochemical products that have been developed. These are the benefits that drive this project, and others.

To the question "What is the purpose, if indeed there is a purpose, of oil being in the ground?" If there is a purpose, then what are the consequences of the removal of all, or even most of the oil and gas? Whether this question has been asked before, I do not know. So far, I suggest it has been assumed it is proper to locate, develop, and use every barrel of oil existing underground, as long as it is economic.

to do so, since this is what generates wealth and a high standard of living. The energy contained in oil and gas has reduced the physical energy traditionally required of man.

It is to the question of "What purpose does oil serve to remain in the ground?" that I wish to address.

I believe that the removal of large quantities of oil and gas from the earth spells doom and destruction for this planet. That is a very large statement and a most serious one. I wish I did not believe it. I hope it can be proved to be false.

Your panel has lived experts on sea birds and mammals, and fish, and ice dynamics and oceanography. I hope these people can be useful, but I suggest there and many other experts may be needed to show the above statement to be false, or to verify it.

I believe that oil and gas in the earth has an influence, and is a controlling factor of the earth's magnetic field. I believe that a severe disturbance of the earth's magnetic field will produce the results attributed to the legend of Atlantis, or the flood in the days of Noah. Viewed from a scientific point of view, such legends or myths is hardly worthy in itself for serious research or a cause for delay or non-development of an oil field.

From a scientific point of view, the questions I ask your panel of experts you have lived, or wish to live, to answer technical questions are these

1. Can the removal of large quantities of oil and gas from the earth have a serious effect on the earth's magnetic field?

2, Would a serious disturbance of the earth's magnetic field produce a destructive effect on this planet?

As some of your experts may know, but many of your panel may not know, a magnetic field is a force that you cannot see and cannot feel, nor smell nor touch, nor hear, yet is it instrumental in our existence. Our brain develops its own magnetic field. We walk and sleep in the earth's magnetic field. The earth's magnetic field exists because of the flow of billions of amps of electricity in the core of the earth and produces a magnetic field both below the surface and extending I believe some 600,000 kilometers from earth. The earth makes its yearly orbit within the magnetic field of the sun, and the sun within the magnetic field of the galaxy. A magnetic field is said to exist throughout the universe.

Of the earth's magnetic field, we navigate by it using a compass. Fish and birds migration patterns are based on it. Earthquakes, lightning, atmospheric disturbances are related to it. A recent study has shown a strong relationship between human provoked sighting of UFOs and earthquakes, showing a connection between brain activity and magnetic field disturbance during an earthquake.

It is that man has used oil as an electrical insulating medium in his electrical creations (transformers on utility poles or substations), this should in itself make it not surprising if oil serves a purpose in earth's electrical system.

The electrical system of the earth is very gigantic. For example,

though we see it only a few times a year, lightning hits earth 1800 times every second, on average. Some 2500 forest fires this past month in British Columbia, 30 or more in Labrador, many in further western states, many of which are started by dry lightning, the killing of five cows last week by lightning near Portugal Cove, the "super lightning bolt" that hit Bell Island in 1976 that opened an investigation by U.S. experts and a write up by Reader's Digest. These, to me, are an indication of the earth's magnetic field being disturbed.

In 1983, 84, and 85, the worst ice conditions of Nfld, perhaps on record, during dulling days of winter for months, are to me, an indication of a disturbed magnetic field.

The arrival in Nfld of land species from Europe, never seen in Nfld before, as well as numerous other sightings in Nfld of birds foreign to this island, to me is an indication of a disturbance of the earth magnetic field.

The catching of some tropical fish in northern Nfld waters in recent years, never before seen here, to me is a indication of a disturbed magnetic field.

The existence of solar induced currents in the neutral of our electrical system is a proven fact of a magnetic field disturbance.

The recent records being set for both high and low temperatures and rainfall amounts in short periods of time (note the flooding of Bay of Fundy River) in many parts of North America and else where, to me, is an indication of a disturbed magnetic field.

I can present ~~present~~ many more examples, but is beyond the scope of this short paper. The vast scope of the fields involved makes it difficult for me to do extensive research myself.

Nevertheless, these unusual occurrences, to me, is a sign, or signs of something going wrong with the earth's system. If a cause of this is the removal of vast amounts of oil and gas, then I fear we will see ~~will see~~ much more drastic consequences in years to come. I fear it is a prelude to a man made future ice age and reversal of north and south poles. Ice ages and pole reversal (or severe disturbances) have happened before, this is well known. Can men bring it about?

I have much data to back up my conclusions on this subject. It is my hope that your panel will find my question worthy to answer, and perhaps investigate them further.

Winston Adams

A PRESENTATION
BY THE
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
TO THE
HIBERNIA ENVIRONMENTAL ASSESSMENT REVIEW PANEL

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I. PREFACE

This document outlines the comments of the Government of Newfoundland and Labrador respecting the Environmental Impact Statement on the Hibernia Development Project presented by Mobil Oil (Canada) Limited on May 15, 1985.

This commentary is provided to assist the Hibernia Environmental Assessment Review Panel in its preparations for the Public Hearings which are scheduled for the Fall of 1985.

II. EXECUTIVE SUMMARY

Introduction

The Government of Newfoundland and Labrador has reviewed the Hibernia Environmental Impact Statement and offers the following comments regarding the biophysical and socio-economic assessments to the Panel for its consideration. Observations concerning the information base, methodology and identification of possible mitigative measures are included. Suggestions are made regarding additional information where it is felt such information would be helpful to the public hearing process.

Summary (Vol. I) and Project Description (Vol. II)

Government has observed that the Summary (Vol. I), by itself, does not always convey the relative significance of the impacts and effects of Hibernia development. The prominence given to many issues in Volumes III and IV, and in the background studies by consultants, was reduced when these issues were described in the Summary.

The Project Description (Vol. II) is believed to be

The Project Description (Vol. II) is believed to be comprehensive and sufficiently detailed to afford the public an appreciation of the scope of the project. It is noted that engineering and technical components will be subject to Government review when the Development Plan is submitted in mid-September and with safety and contingency issues will be subject to regulatory approval and will be subject to detailed examination in that context.

Biophysical Assessment (Vol. III)

In general, Government is satisfied with the depth and detail provided respecting biophysical impacts. However, there are several areas where we suggest further comment would be useful.

While the EIS addresses the possible consequences of an oil spill, the implications of a spill in ice covered waters have not been discussed in terms of potential clean-up difficulties or with regard to predicting oil slick trajectories.

The implications of continuously discharging produced water containing various chemicals and hydrocarbons during

production are unknown. Although Mobil's stated intention to focus an effects monitoring program on this issue seems appropriate, further details of such a program will be required to confirm its adequacy.

The EIS does not provide information on the consequences of the accidental loss and failure to recover a 2 ton container of biocide, an event which could occur while unloading a supply vessel or when encountering heavy seas while enroute to the site. Since it appears that the impacts of such a large discharge cannot be predicted, the need for mitigative measures, such as reducing shipment size, is suggested.

We have observed that data regarding recent extreme storm conditions, the formation and extent of pitting by icebergs, salmon distribution and impacts on species which are normally terrestrial but utilize the marine environment are not included. It is suggested that where these factors will be included in the coming design phase, this should be stated.

SOCIO-ECONOMIC (Vol. IV)

Methodology

Problems have been identified in the methodology used for the socio-economic assessment. These include:

- 1) estimates of labour supply;
- 2) criteria used for identifying impact areas;
- 3) the infrastructure construction occasioned by the Hibernia development;
- 4) the differences in methodology used to forecast benefits associated with the two production systems and failure to consider enhancement measures; and
- 5) the treatment of speculative migration.

These questions are significant but it is felt that they are manageable if the supplementary information, suggested throughout the presentation, is provided.

Industrial Impacts

Benefits from the fixed production system are based on current Canadian industrial capability, whereas those for the floating option assume an expanded capability. A comparison of the benefits from the two systems, using the information presented, can be misleading. This situation can be clarified by stating, for each development alternative, the assumptions used to estimate the components which can be built in Canada and the sites where these can be produced.

The exclusion of Marystown as an impact area is viewed as a serious omission. A socio-economic assessment of the Marystown area should be made available to the public either before or during the public hearings.

The description of measures to increase industrial benefits and mitigate adverse impacts is quite general, and more detail would be useful to the assessment process.

Some graphic illustrations and analytical techniques

employed tend to distort one's perception of the relative merits of the two development modes. It is suggested this area be clarified.

Mobil has the responsibility to require that its contractors and subcontractors adhere to the policies and action plans to which it declares itself committed.

Labour Estimates Data

Estimates of labour force demand in the EIS do not take into account indirect and induced employment effects, nor the impacts on employment generated by measures to increase industrial capability. Labour demand figures are, therefore, believed to be understated. Also, the data base for estimating labour supply yields estimates with a standard statistical error of up to $\pm 40\%$ for some occupational groups. As a result, the value of this information is limited in planning measures to mitigate possible labour supply shortages.

More importantly, labour demand and supply figures are used in estimating population projections, and it is the latter

from which the forecasts of social impacts are derived. The total labour demand forecast appears to be underestimated. Therefore, forecasts of population and social impact must be questioned. It is suggested that a more useful technique would be to provide high, medium and low labour and population forecasts for each development option.

Labour supply data for the four impact areas could be expanded.

Supplementary estimates on indirect, induced, short term and seasonal employment generated by the Project should be supplied for the Province as a whole and for local impact areas.

Impacts on Employment

The degree of co-operation received from employers will have a major impact on employment opportunities for qualified workers from adjacent areas. Mobil should describe the measures it intends to use to ensure contractor and subcontractor compliance with employment benefit policies.

Mobil's contingency plans to accommodate peaks in labour force demand resulting from construction schedule shifts should be described. Extreme peak labour force figures should be made available so that possible social impacts can be assessed.

Economic Impacts

Some macroeconomic impacts predicted for Canada and Newfoundland are based on assumptions which are potentially misleading. For example, the assumption that a floating system would be built entirely in Canada results in a likely over estimate of both employment benefits and adverse social impacts. Similar difficulties in the presentation of economic impacts have been observed.

Impacts on Demography

Demography forecasts are based on questionable labour force projections. The impacts of speculative and return migration, associated infrastructure construction and other indirect and induced effects appear not to have been taken into account.

Impacts on Fishery

The fishing industry could be affected by competition for skilled marine personnel, but mitigative measures have not been suggested. Fishery resource issues are addressed in Volumes IIIa and IIIb.

Other Observations

- (a) Estimates of housing requirements appear to be conservative;
- (b) The efficacy of work camps in addressing social issues needs further clarification;
- (c) The data on infrastructure requirements should be expanded;
- (d) Further discussion of potential social problems is suggested;
- (e) Proposed affirmative action measures for employment-disadvantaged groups, particularly women, should be described.

Conclusion

Demographic changes generated by the industrial impact of

Hibernia will determine the type and magnitude of social changes that will occur in the Province. It is important that estimates of these two parameters be as accurate as possible. It is believed that the methodology employed to estimate demographic changes understates population growth, with a consequent understatement of social impacts. The estimates of social effects described in the EIS should, therefore, be considered conservative when used for planning purposes.

While the potential impact of the Hibernia development on the biophysical environment is subjective in nature and also appears to understate some effects, a quantitative basis to either substantiate or refute the impact analysis does not exist.

Subject to the provision of certain additional information before or during the public hearings, the Hibernia Environmental Impact Statement provides an adequate basis for the public hearing process. More precise information will become available as the development concept becomes more clearly defined. However, an attempt could be made by Mobil to provide certain additional information either before or during the public hearings.

III. COMMENTS ON BIOPHYSICAL ASSESSMENT (Volumes IIIa and
Volumes III b)

General Comments

- 1) The impact analysis method used in Mobil's EIS is qualitative rather than quantitative in nature and, thus, somewhat subjective. The impact rating system assigns impacts throughout the EIS which appear to be overly optimistic; however, as these do not have a quantitative basis (indeed, in many cases numerical data do not exist) it is difficult to either substantiate or refute these impact ratings.

- 2) Produced water discharged during production will contain various chemicals and hydrocarbons. As stated by Mobil, it is likely that "breakthrough" of injection water will occur and, therefore, chemicals used during drilling (biocides, corrosion inhibitors, etc.) will appear in produced water and be discharged into the marine environment. As this discharge will be continuous and as the rates of produced water to produced oil increase

during production, the effect on marine life should be considered. At present, we do not know the implication of chronic, sublethal exposure of marine organisms to many of these chemicals; therefore, it is impossible to predict the impact on organisms of the Grand Banks. The stated intention to focus an effects monitoring program largely on this issue indicates Mobil's concern. It would be useful to have more details of such a proposed monitoring program.

The above comment also applies to Section 4.3.3.1 dealing with routine discharges. It should also be noted that the treatment for produced water, as outlined on page 47, is for hydrocarbons only and does not alter the chemical content of the discharge.

- 3) Cuttings from any oil-based drilling muds used will have toxicity based on (a) oil content and (b) identity of the specific base oil used. Without the base oil identity, therefore, an assessment of predicted impacts is impossible.

Vol. IIIa

3.1.2.8 - Wave Climate, p. 57 - Predicted Extreme Conditions

Several storms have occurred after the data cut-off date of 1980 which had wave heights larger than those selected for analysis. Some discussion of the effect that these observed storms could have on the predicted extreme conditions should be provided.

It is noted that these revised data will be taken into account in the design review required before facilities approvals are given by the regulatory authorities.

3.1.4.5 - Shallow Geology, p. 95, Pits

It has been recently shown that some pitting is caused by icebergs and results in excavations much larger than previously thought. Extreme values for pits are not mentioned nor is the existence of a pit 7 nautical miles east of Hibernia which measures over 10 m deep and 150 m wide. More discussion of the formation and extent of pitting would be useful.

IIIa, pg. 216 - Energy Flow on the Grand Banks - Flemish Cap

In the discussion of nutrient flow through the ecosystem, particularly the flow of carbon energy to the benthic community shortly after the spring bloom, the EIS indicates that this period may be critical to benthic production and, hence, to production at higher levels. However, it is not mentioned that this would also be the time when flux to the benthos of foreign substances such as hydrocarbon residues or heavy metals which absorb on detritus may be significant.

VOL IIIb

IIIb, Section 4.2.3.5, pg. 31 - Hydrostatic Testing Fluids

This section indicates some of the chemicals that may be used in the hydrostatic testing fluids. The Panel is referred to the earlier comments on page 12 concerning "produced water".

IIIb, Table 4.3-4, pg. 44 - Liquid and Solid Effluents;
Fixed Production System Operations

This table provides information on storage displacement water. No maximum treatment is proposed for this water which is discharged at a maximum daily rate of 32,000 m³. The water soluble fractions of the oil contained in displaced water would be mostly the more toxic light ends. A discussion of any resulting environmental loading and the need, if any, for treatment of the water prior to its discharge would be useful.

IIIb, pg. 68 - Oil Spills

It is suggested in paragraph 1 on page 8 and in Figure 4.5-1 on page 61 that Hibernia shuttle tankers enter regular shipping lanes "very soon after leaving the Hibernia facilities" and, since they would displace existing international tanker traffic, the problems and/or probabilities associated with a near-shore tanker spill need not be considered. However, a tanker route from Hibernia to a point near southeastern Newfoundland, unlike an established international shipping lane, would have little

flexibility to shift southward in a severe sea ice or iceberg year, simply because Hibernia is located on the north-east Grand Banks. A supplementary discussion of this factor would be useful.

IIIB, pp. 73-81 - Fate of Hibernia Crude: Potential
Biological Impacts

It is stated in the supporting document "Hibernia Oil Spills and Their Control" (Ross, 1984) that oil produced from the Hibernia field has a high tendency to quickly form stable emulsions under nearly all of the spill scenarios considered. The estimates of viscosity and densities for such emulsions which are quoted, raise the following issues;

- 1) The predicted rates for natural dispersion of these emulsions are essentially based on observations of a relatively non-viscous emulsion under springtime conditions in the North Sea.

The proponent should indicate any uncertainties associated with the natural dispersion curves given in Figure 4.7-4.

- 2) Additional information should be provided on existing evidence, if any, that dispersion of a quantity of highly viscous emulsion by moderate to high seas is, in fact, a permanent rather than a short-term effect. The limiting values (e.g., for ambient temperature, sea state, age of emulsion, etc.) should also be provided.
- 3) Because an emulsion could have a density approaching that of seawater, the possibility presumably exists that the emulsion could move below the surface under some conditions. This possibility should be discussed with reference to:
 - what the limiting conditions for subsurface movement would be;
 - the vertical extent of such movement;
 - the implications for trajectory modelling, since the emulsion would no longer be on the surface, and possibly not even in the surface layer;

- the implications for oil spill surveillance, particularly remote sensing techniques;
- impacts on the commercial fishery;
- assumptions on hydrocarbon sinking or settling rates and the resulting implications for the impact on benthos.

IIIB, Table 4.7-4, pg. 81

This table provides a summary of "worst case" potential impacts of an oil spill prior to mitigation. The Panel's attention is drawn to the general comment on page 12 concerning the impact analysis method.

IIIB, pg. 82, Paragraph 1

This paragraph discusses calculations of the level of impacts in the case of blowout at various distances from the blowout. The factors not included with respect to the calculations (i.e., plankton spatial and seasonal patchiness) are of a magnitude to render questionable the entire calculation exercise. The estimate would certainly be altered and would either increase or decrease the

potential impact.

IIIB, pg. 82, Paragraph 3 - Salmon

This paragraph discusses the presence of salmon feeding over deep water 250-300 km southeast of Hibernia and supposedly compares salmon distribution (Figure 3.2.27, pg. 168, Vol. IIIa) with oil slick trajectory plots. This figure shows salmon migration not distribution. There is not sufficient specific information available regarding the area of salmon distribution to enable a statement to be made that there is a low chance that this area would encounter an oil slick.

IIIB, pp. 80-83

This section discusses the impact of spilled Hibernia crude on seabirds and mammals. The possible impact on species normally considered terrestrial but which, in fact, utilize the marine environment to a large degree, i.e., eagles, otters, osprey, etc., should not be overlooked for the case where a spill might approach land.

IIIb, pg. 83 - Potential Biological Impacts: Marine Mammals

The first paragraph of this section represents the only reference to the problem of oil in ice (although a more detailed discussion is available in the Ross report). A summary of the potential physical effects of ice on a Hibernia oil slick, and the effect of ice coverage on countermeasures efficiency should be publicly acknowledged.

IIIb, pg. 85 - Potential Impact of Oil on Shoreline

Biological Resources

The discussed low probability of oil contacting Newfoundland shorelines refers to oil resulting from a blowout or spillage at Hibernia. Neither the problems nor probabilities of oil issuing from increased tanker traffic somewhat closer to the shoreline are discussed. The cumulative nature of these events should be considered and proposals for mitigative measures should be described.

IIIb, Section 4.7.2, pg. 85 - Chemical Spills

Paragraph 2 in this section points out that a "worst-case" chemical spill would be the loss of a reinforced shipment container of biocide (approximately 2 tons) during loading operations from a supply boat. Normally, attempts made to recover such a loss would be successful." The likely consequences associated with the loss of a smaller container (10-25 kg. drum) are then described. No information is provided on the consequences of a 2 ton container not being recovered. If the impacts of 2 tons of biocide cannot be predicted, consideration should be given to alternatives which minimize the risks, possibly by prohibiting the use of such a large container for shipping biocide and/or shipping smaller containers below decks.

IIIb, Section 4.8.3.4, pg. 93 - Onshore Waste Disposals

Onshore waste disposal is alluded to in a number of places in Volume IIIb (i.e. Sections 4.8 and 3.4). However, no estimate is provided of the quantity of waste materials that might require disposal at, for example, a landfill site.

While the amount might be negligible, provision of an estimate would remove any uncertainty.

IIIB - Table 6.0-1, pg. 105

This table provides a summary of "worst-case" residual impacts from routine events following mitigation. The general comment on page 12 regarding the impact analysis method is applicable to this table.

IIIB - Appendix C, Table C-2, pg. 141

This part of table 2 summarizes, among other things, the residual impacts of solid and liquid releases into the environment. The residual impacts may not be as transient as indicated, as this depends on the chemical nature of the effluents.

IIIB - Appendix D, Table D-1

This table describes typical active components of the chemical products used during oil and gas production. The

general comment on the impact analysis method is relevant in considering this table.

IIIb - Appendix E, Table E-1, pg. 158

This table summarizes the potential impacts of liquid/solid releases on the physical and chemical environments during operation and maintenance. The earlier comments on produced water (page 12) are relevant to consideration of this table. The proponent should be required to monitor this situation closely during production. All chemicals used should have prior approval from the appropriate regulatory agency.

IV. COMMENTS ON SOCIO-ECONOMIC ASSESSMENT (VOLUME IV)

IV. Section 1.4, pp. 4-10 - Impact Assessment Methodology

The socio-economic assessment methodology determines the usefulness of the EIS as a planning document.

The magnitude of demand and source of supply for labour will greatly influence social impacts. While Mobil admits to an error factor of up to + 25% in its labour demand projections, these do not take into consideration possible manpower skills, upgrading programs and measures to improve industrial capability by government and industry which could greatly increase local labour supply and demand. Errors in labour estimates will result in errors in estimates the impacts on housing, public services, land use, education and social fabric.

Labour supply and demand, and the predictions of impacts derived therefrom, could be provided for the high and low ends of the range of possibilities as well as for the most likely situation. As well, some attempt should have been made to obtain baseline manpower data for the communities in the local impact areas.

It is generally acknowledged that Marystown will be one of the centers for new and/or additional industrial activity associated with the Hibernia development. The proponent acknowledges this possibility in Section 4.1.6, yet Marystown is not identified as a local impact area and its exclusion is considered a major omission.

The absence of estimated impacts arising from the infrastructure construction which may be generated by the Hibernia development is noted. The incremental impacts of infrastructure, such as highway construction, could be significant. The EIS should have attempted to quantify the cumulative effects of the project.

Assumptions used to forecast the impacts of the Floating Production System are questionable in light of the numerous statements in the EIS which indicate that construction of a floating production platform is clearly outside the industrial capability of Canadian fabricators and/or shipyards. Therefore, it seems unlikely that the estimated benefits and effects for the Floating Production System will materialize, were a floating system chosen and a comparison

of the benefits indicated for the floating and fixed systems is misleading. This issue will be discussed in greater detail with reference to the section dealing with impacts on industry.

The methodology used does not attempt to quantify speculative in-migration. Large scale speculative in-migration could have major social implications and some allowances should have been made for it in demographic estimates and impact forecasts.

IV. Section 4.1, pg. 179-198 - Impacts on Industry

The methodology and assumptions applied to the estimates of potential participation levels in the Hibernia development by Canadian and Newfoundland industry are of paramount importance since all direct economic, employment and social effects emanate from the project's industrial activity.

An assessment of industrial capability is critical in establishing the parameters of the overall socio-economic assessment. Consequently, the results of specific industrial capability surveys conducted by Mobil and its

consultants would have been useful in assessing the reasonableness of the estimated Canadian and Newfoundland industrial content.

Descriptions of the EIS methodology on pages 6 and 179 of Volume IV indicate that a key criterion in estimating Canadian and Newfoundland industrial content was "present industrial capability".

While there was adherence to this criterion in estimating the Canadian and Newfoundland industrial content of a fixed production system, it was not followed in estimating benefits from a floating system. The prospect of a floating system being built in Canada clearly assumes an improved industrial capability as evidenced on page 181 of Volume IV:

Canadian yards and fabrication shops could construct many components of the Floating Production System. The storage vessel and tankers, however, exceed the capacity of any Canadian yard. There is also no shipyard in Canada large enough to construct the floating production platform as one unit. Mobil is continuing to investigate alternate construction techniques.

The magnitude of the Canadian construction assumption is reflected in Table 3.1-2 whereby almost one-third of the total development phase employment is derived from construction of the floating production facility. However, construction of a floating structure in Canada is speculative. The economic and employment benefits from this development alternative must be similarly regarded, whereas the benefits of the fixed system are based on more realistic assumptions.

A presentation of the relative effects of each development option based on realistic assumptions of industrial capability is desirable. The underlying assumptions of industrial capability and content must be consistent for both development options.

The Newfoundland industrial content range for the floating production option is lower and much wider than the range for the fixed development option. The assumed full achievement of industrial content for both options is, therefore, likely to overstate the relative economic benefits of the floating system for Newfoundland. The midpoint of the potential

industrial content ranges is a more realistic assumption and would minimize the risk of overstating the industrial benefits of the floating production system alternative relative to the fixed system.

The Canadian and Newfoundland industrial and employment impacts of both development options are illustrated through the use of bar graphs (Figures 4.1.1 through 4.1.4 and Figures 4.2.1 and 4.2.2). These bar graphs are scaled differently and, as a result, tend to distort the perceived relative benefits of the two options.

A balanced assessment of the relative merits of each development mode requires an indication of the probability of proceeding with the second phase of the floating production system. In addition, a full description of the decision making parameters affecting the Phase 2 decision should be provided.

The potential industrial activity at Marystown (page 197 of Volume IV) could be substantial, given the number of components and sub-components for which Marystown Shipyard has the necessary basic facilities and skilled work force.

However, Mobil assumes that industrial activity at Marystown will be minimal.

The projected industrial activity for Marystown seems to reflect an overly pessimistic view of the capability and competitiveness of Marystown Shipyard. Despite sluggish market conditions since 1980, Marystown Shipyard successfully competed for, and constructed, two of the three fishing trawlers added to the Newfoundland fleet, built eight offshore supply vessels and increased its servicing capability for offshore oil rigs.

The principles and guidelines describing Mobil's measures to improve industrial impacts (Section 4.1.7) are general and do not specify the degree to which these measures will optimize Canadian and Newfoundland content. While the Canada/Newfoundland Benefits Plan and the Hibernia Development Plan will provide more specific information, the EIS should provide the public with sufficient detail to enable an informed opinion to be developed concerning the adequacy of the measures proposed to increase the spinoff benefits from the development.

Contractor commitment and adherence to the operator's benefits policies and programs are essential to the overall achievement of Newfoundland and other Canada benefits objectives. Mobil should describe how it will ensure that its benefits policies and action plans are implemented by its contractors and sub-contractors and the mechanisms it contemplates in terms of monitoring and reporting.

IV. Section 4.2, pp. 200-218 - Impacts on Employment

The development of the Hibernia oil field will likely have significantly greater employment implications for Newfoundland than is suggested in the EIS. Some of the data used to determine Newfoundland labour supply could have a standard statistical error of up to $\pm 40\%$. Therefore, the EIS labour supply estimates should be used with caution.

There appear to be discrepancies in the labour supply data, but occupations in which potential shortages may occur, appear reasonable. With the co-operation of Mobil and sufficient lead time, training programs can be provided for Newfoundlanders to acquire the occupational skills needed for offshore development.

The success of Newfoundlanders in obtaining employment during the development phase is largely dependent on the degree to which a local employment or preference policy is adhered to by employers, the co-operation of employers in facilitating Government's monitoring effort, as well as the expeditious provision of detailed job descriptions by Mobil to enable the development of specialized training and retraining programs. Therefore, it is necessary for Mobil to identify the steps it will take to regulate the behavior of its contractors and sub-contractors with respect to employment practices, as well as to identify any special qualifications needed by workers.

Mobil intends "to make special efforts to extend a full and fair opportunity for participation to qualified members of employment-disadvantaged groups". The company should describe the measures it intends to use.

While four impact areas have been identified, there is no discussion of local labour supply, especially as it relates to the impact areas outside St. John's. An inventory of local skills can be prepared in a relatively short time frame, as has been demonstrated by surveys recently

conducted by the Isthmus and Trinity-Placentia Development Associations. Mobil should have undertaken similar skills inventories in the impact areas of Come-by-Chance, Argentia and Marystown. This can still be done in time for planning purposes.

The socio-economic impact sections are based on the expected peak labour force demand. In almost all energy development impact areas in the North Sea, Alaska and the Western United States, the original labour demand projections were grossly underestimated. Weather and other factors can shift the work schedule so that actual labour force peaks are much greater than those forecast. Mobil should describe its contingency plans to deal with such events before or during the public hearings.

Indirect employment and the impact of short seasonal employment during the construction/development phases, are not discussed. Supplementary estimates on indirect, induced and short seasonal employment generated by the project should be supplied for the Province as a whole as well as local impact areas.

IV. Sections 4.3 & 4.4, pp. 219-231 - Economic Impacts on
Canada and Newfoundland

The economic impacts on Canada and Newfoundland have been estimated through econometric models of the national and provincial economies. These forecasts are based on the same assumptions used to generate the estimates of industrial impacts, the problems with which were discussed on pages 27-32. The results of the econometric modelling would present similar problems and the impacts predicted for a floating production system could be misleading. In addition, it is noted that the pattern of total employment growth illustrated in the "Informetrica" background information study differs from that projected for direct employment as described in Volume IV. Discrepancies as to the timing of peak employment should be explained.

The aggregate economic output and employment growth estimates for both development alternatives appear to be similar but there are substantial differences when they are compared on an annual basis. Annualized, the economic and employment benefits for the fixed option are respectively about 100% and 50% greater than those for the floating system.

The presentation of the economic impact analysis should enable the public to compare the relative merits of the two development alternatives.

The presentation of economic impacts in both Volume IV of the EIS and in the background macroeconomic assessment by Informetrica Limited does not distinguish between the GDP impact associated with development activity and the GDP impact due to production. For example, under the fixed production system, the increment to employment is roughly the same in 1989 and 1996 at 7700 and 7400 person-years respectively while the increment to real GDP is \$272.6 million (\$1984) in 1989 and \$1401.0 million (\$1984) in 1996. Clearly, the implications of the two impacts are quite different. Analysis of the distinctions would be possible by providing another macroeconomic indicator such as wages and salaries.

Clarification is necessary regarding statements in Section 4.3 and 4.4 of Volume IV to the effect that "the number of person years of employment generated by the project does not represent the number of people who will find new jobs since

much of the total would be taken up through increased productivity of the existing labour force in industries currently operating under capacity" (page 228). An explanation of how labour productivity was treated in estimating employment impacts is warranted.

Total employment impact is an aggregate figure and does not differentiate between direct, indirect and induced effects. This limits the ability to assess this critical economic benefit.

IV. Section 4.5, pp. 233-245 - Impacts on Demography

The entire demography section presents problems because it is based on questionable labour force projections. These problems have already been identified. (Refer to pages 25-27, 32-34).

There is a widely held belief that speculative in-migration can have major impacts in the socio-economic context - rental rates, unemployment, social services and other parameters. Small communities can be severely affected by even a relatively small number of in-migrants, especially in

the provision of services. The EIS does not offer any estimates of the possible magnitude of speculative in-migration, but assumes that returning Newfoundlanders will not be a problem in rural areas.

Data from similar types of mega projects as well as the in-migration already associated with the Hibernia discovery are available and should be provided and discussed. Since speculative in-migration has not been estimated in compiling the population forecasts, and demographic data form the basis for determining other impacts, forecasts of social changes could be understated.

The EIS states that "any demographic change initiated by Hibernia development which is greater than can be absorbed by the area in which it occurs should be avoided". However, the EIS does not include estimates of the carrying capacity of the human and infrastructure systems in the local impact areas or any discussion of the implications of demographic change that surpass the impact areas' capacities.

There are also several instances where the information provided on population change, labour demand and in-migrants

appear to be inconsistent. For example, the peak year for Hibernia associated population increase in St. John's is expected to be 1992 when about 510 in-migrants will arrive. However, Table B 2-8 indicates that this is a year in which labour demand for Hibernia in St. John's will be 30 people. In addition, the population increase for St. John's peaks in 1992 but labour demand in the city peaks 4 years earlier in 1988. These apparent inconsistencies should be reconciled.

During the construction of the Come-by-Chance oil refinery when employment peaked at 1700 persons, the resident population increased by 56%, but Hibernia, a comparable project, with an estimated peak labour force of 2,265 in the same area, will represent only a 9% increase in the 1990 resident population. Again the need for an explanation by Mobil is suggested. As well, estimates of anticipated in-migration to rural impact areas should be provided.

IV. Section 4.6, pp. 246-254 - Impacts on Fishery

The fishing industry could be affected by competition for skilled marine personnel, but measures to mitigate this effect have not been suggested.

Fishery resource issues are addressed in comments on the Biophysical Assessment.

In describing the significance of the fishery in the Argentia Impact Area, a statement is made that "This area makes a relatively small contribution to the total Newfoundland fishery." The significance of the fishery to particular areas should be viewed from the perspective of local residents as well as from a provincial point of view.

IV. Section 4.7, pp. 256-266 - Impact on Housing

The impact of Hibernia development on housing supply and demand is directly related to population changes. Since many of the assumptions in the EIS are not based upon strong empirical data, the predicted impacts must be questioned. The fact that no attempt has been made to estimate the number of Newfoundlanders who might return, as well as to quantify the level of speculative in-migration, adds to the uncertainty. Similarly, the conclusions relating to the impacts on the prices of housing and land are nebulous.

There are several instances where the information provided on population changes, labour demand and household formation appear to be inconsistent. For example, the EIS indicates that in 1991, with a labour demand of 50 persons for St. John's, household formations will peak at 243, or 13.5% of the total household formations associated with the development. Mobil should explain this inconsistency.

Not all workers will decide to live in work camps and the heavy transient population could well have a major impact on cost and availability of rental accommodation in rural impact areas where the rental stock is practically non-existent. An attempt to estimate this effect should be made.

IV. Section 4.8, pp. 267-282 - Impacts on Public Services
Commercial and Industrial Infrastructure

An attempt should be made to distinguish between components of infrastructure required exclusively for the Hibernia development and, thus, the responsibility of the project, and those which will either need improvement because of the increased utilization generated by the Hibernia development,

or need to be put in place earlier than would be the case without Hibernia. The Trans Canada Highway upgrading is an example of the latter.

IV. Section 4.9, pp. 285-314 - Impacts on Community Services and Social Infrastructure

The minimal references to Occupational Health and Safety appear to understate the importance of this area. The report dismisses, without substantiation, the question of an increase in the incidence of major crime, despite the fact that "crime and violence" are among the three most important public concerns identified in Mobil's attitude surveys.

Large scale energy developments in other jurisdictions have often been accompanied by increases in crime and other social problems. If Mobil is of the opinion that the same will not occur in Newfoundland, it should state its reasons for reaching that conclusion.

The EIS assumes that negative impacts on rural community services and social infrastructure should be minimal due to the utilization of work camps. More information on work

camps and their operation is required to substantiate this conclusion.

The extra burden on the social services system could be significant if Newfoundlanders with families return to the Province on speculation. The extended family may be able to assist, but eventually, the social service system could be called upon to respond. Additional information on the scope for return migration would be useful.

IV. Section 4.11, pp. 325-328 - Municipal Government and Finances

Projected infrastructure requirements should be identified to enable municipal governments to undertake necessary planning.

IV. Section 4.12, pp. 329-334 - Community Issues and Impacts on Social Fabric

The EIS seems to pay little attention to the possible effects of the project on rural society, and those which are identified are assumed to be capable of being offset by the

plan to use work camps. The only mitigative measure proposed to alleviate negative impacts on rural society is to inform the relevant public. A more sensitive approach to this issue could be expected.

The EIS suggests that, as most jobs on large construction projects are in traditionally male-dominated trades and professions, direct employment for women is expected to be concentrated in traditionally female dominated occupations such as secretarial, administrative and catering services. This notwithstanding, Mobil should indicate the measures it intends to take to increase the scope of employment opportunities available to female workers.

V. SUMMARY OF OBSERVATIONS

In our review of the EIS, we have observed areas where the provision of additional information could make the document more useful to the public for review purposes. These are:

Biophysical:

1. the implications of recent extreme storm conditions;
2. the formation and extent of iceberg pitting;
3. the effect of foreign substances on benthic production;
4. consequences of a tanker spill along tanker route(s);
5. impact of an oil spill in ice;
6. uncertainties associated with natural dispersion curves;
7. permanency of dispersion of viscous emulsions (including limiting values);
8. the impact of the spatial and seasonal patchiness of plankton on blowout calculations;
9. salmon distribution on the Grand Banks;

10. the impact of spilled oil on species such as eagles, otters and osprey;
11. the cumulative effects of oil arising from increased tanker traffic;
12. the consequences of a 2 ton container of biocide not being recovered; and,
13. quantification of wastes requiring onshore disposal.

Socio-Economic:

1. confidence level of labour supply/demand figures and population projections;
2. inclusion of Marystown as an impact area;
3. a comparison of the two development options using the same assumptions;
4. quantification of returning Newfoundlanders and other speculative in-migration on a provincial and local impact area basis;
5. confidence level of the assumption that a floating production system would be built in Canada;
6. probability and guidelines to be used in the decision to proceed with Phase II of the floating production system;

7. details of Mobil's plan to increase industrial benefits;
8. measures to ensure that its benefits policies and action plans are implemented by its contractors and subcontractors;
9. details of action plans proposed to ensure the participation in employment by disadvantaged groups;
10. inventories of skilled labour in local impact areas;
11. contingency plans to deal with extraordinary labour demand peaks;
12. indirect, induced and short seasonal employment forecasts;
13. economic impact analysis;
14. treatment of labour productivity in estimating employment impacts;
15. apparent inconsistencies - population peaks and labour demand peaks;
16. inconsistency between population peaks and housing requirements;
17. impact on rental accommodation caused by transients and those choosing not to live in work camps;

18. differentiation between project and non-project related infrastructure demands;
19. reasons why crime and other social problems will not increase as they did in other jurisdictions;
20. work camps and their operation; and,
21. increased employment opportunities for female workers.

DEPARTMENT OF ENERGY, MINES AND RESOURCES

TECHNICAL REVIEW

of the

HIBERNIA DEVELOPMENT PROJECT

ENVIRONMENTAL IMPACT STATEMENT

Atlantic Geoscience Centre
Earth Physics Branch
Office of Environmental Affairs

August 1, 1985

TECHNICAL REVIEW OF HIBERNIA ENVIRONMENTAL IMPACT STATEMENT

Introduction

The Environmental Impact statement for the Hibernia Development Project has been reviewed by the Department of Energy, Mines and Resources. The review was confined to those aspects of the project relating to the geological sciences. This assessment was undertaken by scientists of the Earth Physics Branch and Atlantic Geoscience Centre, a division of the Geological Survey of Canada.

The issues under consideration relate generally to features of the geologic environment having potential impact on the project. These include seismicity, the interaction of icebergs with the sea floor, sediment transport, and geotechnical problems associated with the marine geology.

With the exception of the seismicity report by Nolan-Ertec, background technical studies which support the E.I.S. have not been received. Consequently our comments, except those concerning seismicity may be subject to review pending receipt and study of the technical documents.

Seismicity and Seismic Risk

The E.I.S. contains a brief summary of seismic risk and seismic design aspects of the project. The summary is based on a detailed and confidential report by Nolan-Ertec Ltd. entitled "Hibernia Gravity-Base Structure: Preliminary Foundation Evaluation".

The Nolan-Ertec Report was prepared in 1981. Since that time there have been a number of developments pertinent to assessment of seismic hazards in the eastern Canadian offshore. These include the following:

- completion of new seismic zoning maps for 1985 edition of the National Building Code using a new methodology (Heidebrecht et al., Can. J. Civ. Eng., 1983, p.670);
- consideration of the appropriateness of these maps to the offshore regions and development of alternative earthquake source zone models for the eastern offshore which address the uncertainty concerning potential future earthquakes similar to that south of Newfoundland in 1929 (Basham et al., Proc. Fourth Can. Conf. Earthquake Eng., 1983, p. 495; Basham and Adams, in U.S. Geol. Surv. Open File Rept. 83-843, 1983);
- discovery of prehistoric slumps along the eastern Canadian margin that suggests that large earthquakes may not be

confined to the mouth of the Laurentian Channel (Piper and Normark, Geol. Surv. Can. (GSC) Paper 82-1B, 1982 p. 147; Piper et al., GSC Open File Rept. 938; Pereira et al., GSC Open File Rept., in press, 1985);

- reassessment of the historical seismicity of the island of Newfoundland and surrounding continental shelves (Adams, Earth Physics Branch Open File Rept., in Preparation, 1985);
- reassessment of the detection thresholds and location accuracies of smaller magnitude earthquakes in recent years (Earth Physics Branch, work in progress);
- development of the first draft of a Canadian Standards Association standard for the design, construction and installation of fixed offshore structures, which contains criteria for establishing environmental loads due to earthquakes (information available from Task Force members);

Thus, one principal recommendation is that earthquake loads at the Hibernia site be reassessed in the light of this recent information.

The Nolan-Ertec report presents an assessment of earthquake loading for a gravity-base structure. Such a structure will presumably have greater earthquake loading requirements than a floating structure which is connected to the sea floor principally by risers and anchors, although we understand that seismic loading on the anchors of a floating structure can be significantly larger than anticipated wave loads, and "Seaquakes" are a potential source of damage. In addition, seismically-induced instabilities such as liquefaction, settlement and slumping could adversely affect the sea-bottom facilities of a floating structure.

The conclusions drawn in the Nolan-Ertec Report depend critically on the assessment of the seismicity of the Hibernia region. This, in our opinion has been done poorly and we present more detailed comments below. In general terms, however, we find the methods in the "seismic design criteria", "liquefaction potential", and "earthquake loads on GBS" sections in the Nolan-Ertec Report to be quite acceptable and comprehensive.

The federal seismograph network in eastern Canada provides reasonable coverage (about magnitude 3.5 and greater) for earthquake on land near the east coast, but considerably poorer coverage offshore. Within the last year, a special project at Earth Physics Branch has begun to analyze the data from the temporary seismograph stations that Memorial University has operated since 1976. With these the coverage is approximately magnitude 3.5 in the near-shore region of the southern Grand Banks. Coverage on the outer Grand Banks and Hibernia region is less good. Thus we disagree with the assertion in the Nolan-Ertec Report (Appendix B) that events "down to about magnitude 3 in the vicinity of the Grand Banks would have been detected if they had occurred during the last 5 years."

The Newfoundland stations operated by Memorial University represent the only activity currently being devoted to routine monitoring of small offshore earthquakes. We note in the Hibernia E.I.S. that seismicity is one of the parameters that will be continuously measured and recommend continuation of the Memorial University Project.

The lack of understanding of the earthquake rates and distribution becomes critical when earthquake source models are to be developed for probabilistic seismic risk analysis. It appears that the magnitude recurrence curve for the "Grand Banks Seismotectonic Province" in the Nolan-Ertec Report is based on two earthquakes, one of which an Earth Physics Branch study has recently relocated outside of the Grand Banks area. Apart from the serious lack of information on its earthquake rates, including maximum magnitude, we find the hypothesis of a Grand Banks Seismotectonic Province to be a reasonable one for seismic risk analysis.

The overall seismotectonic model, however, has a serious deficiency. We accept as a hypothesis that the largest earthquakes may be confined to the major structural features such as the Glooscap Newfoundland Fracture Zone trend, but such a hypothesis must then be included as a source zone in the probabilistic analysis. Nolan-Ertec omitted such source zones because "a recurrence interval for the larger events could not be reliably established". The rates and location of 1929-type earthquakes are the key questions in a seismic hazard evaluation of the Grand Banks region, and must be treated in considerable depth, not ignored because they are poorly known. The low frequency ground motion for the Hibernia "Safety Level Earthquake" is shown in the deterministic analysis to be dominated by the "far-field" large earthquake. The Hibernia E.I.S. states a corresponding return period of 200 years; it must be noted that this return period is completely undefined because no attempt has been made to assess possible recurrence intervals for the large earthquakes. Recent studies by AGC of the 1929 and prehistoric slumps are pertinent to this question.

With respect to probabilities of exceedence, we have previously noted that more consideration might be given to the probabilities adopted for the seismic design levels. For example, the new seismic zoning maps for the 1985 National Building Code use a probability of exceedence of 10% in 50 years. (i.e., equivalent to a return period of 475 years.) It would seem appropriate that the probability of a Hibernia structure "Safety Level Earthquake" be at least as low, though the estimated production platform life of 25 to 30 years could be substituted for the 50 years Building Code value.

Geology and Seismic Risk

In commenting on the relationship between geology and seismic risk the Nolan-Ertec Report notes that "little is published about the geological structures of the Grand Banks" and that therefore "it is not

possible to estimate size and location of future earthquakes from geological data" (p. 83-84). This statement needs to be reviewed in the light of the past 5 years work in the Hibernia region (published and proprietary data). Although the Report suggests most tectonic activity was lower Cretaceous or older, the E.I.S. shows faults bounding the Hibernia structure that cut Tertiary rocks. While growth faults in non-indurated strata cannot generate even moderate earthquakes, proprietary deep seismic data available at Atlantic Geoscience Centre show the boundary faults extending down to about 15 km; at such depths the faults could easily be seismogenic.

Ice Scour

The E.I.S. states that the Hibernia area is unique for production of hydrocarbons because of the presence of sea ice and icebergs. The E.I.S. also states that in the Hibernia region iceberg scours at the seabed have a maximum depth of 1.6m.

The scientific community is aware that scour depths as presently observed may be less than the depth at the time of formation. The depths may be less due to uncertainty in measurement from seismic profiles, and to sedimentary infill of the scour trough. In addition, sediments beneath the initial scour trough may be influenced by the ice loading. It is not certain whether the scour depth indicated by the proponent accommodates these factors.

Consultation with appropriate experts of Energy, Mines and Resources should be undertaken to determine the maximum "effective" depth of ice scour.

Sea Floor "Pits"

Pits of uncertain origin occur in the sea floor in the Hibernia area. One such pit 10 metres in depth occurs 2 km. from a Hibernia wellsite. One possible origin of these pits is through iceberg grounding, loading and subsequent failure of the sea floor sediments. The occurrence of these features in Tertiary sediments indicates the existence of potentially incompetent foundation materials.

Given the observation of these pits and their postulated origin by iceberg loading the proponent should undertake a geotechnical survey to characterize the foundation sediments when a development site has been chosen and should specify measures to mitigate possible sediment failure under a gravity based structure.

Sediment Transport

Section 3.1.4.5 discusses the dynamic processes at the sea floor and indicates that sediment transport continually changes the microtopography of the sea floor. Additionally we have discovered that the largest bedforms (surface forms of sediment) in the Hibernia area have been found to migrate slowly southward, and are not considered "relict" as described in the E.I.S. The rate of this movement under

extreme conditions is not yet known. As bottom founded structures including connecting pipelines may be affected by migration of bedforms and related current scour, we suggest that the long term effects of sediment transport should be investigated.

If a pipeline becomes a viable alternative for transporting hydrocarbons to shore it is probable that the route would lie to the south and east of Hibernia. Such a route would run through shallow water where sediment dynamics become increasingly important to pipeline planning.

Sea Floor Excavation

Mining of large quantities of aggregate is anticipated for construction and for use as ballast in a gravity based production platform, and may be considered for use as protective berms around pipelines or well heads. If aggregate is to be mined from the sea floor there exists the possibility of significant environmental impacts due to suspension of fine materials in the water column.

Similar concerns are associated with excavations for development wells and disposal of excavated material.

Faulting and Subsidence

The Jean D'Arc Subbasin is known to contain a large group of growth faults. Figure 3.1-49 is a cross section of the Hibernia area which illustrates the complex faulted nature of the subbasin. We are concerned that faults penetrate the Tertiary sediments and may have an effect on the sea floor. The diagram supports this contention as the easternmost fault shows displacement of Tertiary sediments. Recent evidence from the Ekofisk Oil field in the North Sea indicates that significant unexpected subsidence of the seabed has occurred around seven offshore structures. Silts and clays within the Tertiary foundation materials in the Hibernia area are likely to be similarly susceptible to subsidence. It is suggested that a geotechnical-geological program should assess the possibility of this occurrence. In addition, through removal of hydrocarbons and injection of fluids into the reservoir, activity on the faults may be increased with resulting influence on stability of bottom founded installations.

Conclusion

The Hibernia Environmental Impact Statement presents a good overview of conditions in the area of the Grand Banks to be developed. Certain issues are dealt with in a manner that does not give full weight to present uncertainties and gaps in knowledge. It is our opinion that the stability of the foundation for gravity structures has not been investigated thoroughly; maximum iceberg scour depths are not adequately known; that iceberg pits are not fully understood; there is potential

for subsidence either as a result of incompetent foundation conditions or oilfield development; and that seismicity of the Hibernia area should be reassessed.

It is considered essential for assessment of geological conditions that consultant's reports and company data on which conclusions in the E.I.S. are based, be made available to reviewers. Furthermore, as deficiencies are addressed, and site specific detailed engineering studies are made the scientific branches of Energy, Mines and Resources should complete a technical review of supplementary information.

Our conclusion from evaluation of the Environmental Impact Statement is that although further definition of some problems is required no hazards of a geological nature have been identified which would preclude development of the Hibernia oilfield in a safe and environmentally sound manner.

GOVERNMENT OF CANADA
DEPARTMENT OF FISHERIES AND OCEANS

TECHNICAL REVIEW
OF
HIBERNIA DEVELOPMENT PROJECT
ENVIRONMENTAL IMPACT STATEMENT

JULY, 1985

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A. INTRODUCTION

The Review Process

The Department of Fisheries and Oceans (DFO) has reviewed the four technical volumes of the Hibernia Development Project EIS, together with various supporting documents. In conducting its review, DFO has considered the completeness of the EIS in relation to guidelines established in 1980 by the federal government.

As the government agency with the overall responsibility for management of the fisheries and the protection of fish and fish habitat, DFO has reviewed the EIS to ensure that the proposed project does not pose an unacceptable risk to fish resources and their habitats or to fisheries based on these resources.

DFO has a broad base of scientific and technical expertise in a variety of marine and fisheries-related disciplines (i.e. oceanography, hydrography, ecology, toxicology, and fisheries biology). This expertise was utilized extensively in undertaking this review.

The Review Document

This Technical Review document represents DFO's considered opinion on the adequacy of the EIS for the Hibernia Development Project and provides a detailed critique of available documentation provided by the proponent in meeting the requirements of the Environmental Impact Assessment Process. In assessing the technical merit of the EIS, DFO has focused on 1) Adequacy of Information, 2) Impact Assessment Methodology, 3) Impact of the Environment on the Project, 4) Impact of the Project on the Environment, and 5) Socio-Economic Impacts.

In structuring this review document, DFO firstly provides a summary of major concerns and issues organized according to the five broad topics outlined immediately above. This summary section is entitled "Section B, Overview of Major Concerns and Issues."

Supporting the summary section is a comprehensive technical critique of the EIS documentation organized in a manner which follows the sequence and headings used by the proponent in the EIS itself. This section of detailed commentary is entitled "Section C, Detailed Technical Comments." Whereas this section directly supports concerns and issues identified in Section B, its contents are not restricted to matters of major concern alone. Throughout Section C numerous lesser, but nonetheless significant, concerns are raised for consideration by the Panel.

The Review Results

During the course of its technical review, DFO identified a substantial number of concerns and issues arising out of deficiencies in the EIS. As stated above, these are identified, in Section B, for the Panel's

consideration. The Panel should note that the concerns have not been prioritized in that all are considered as being important.

In presenting these concerns arising out of deficiencies in the EIS, we are asking the Panel to consider the necessity of having the proponent address same in a meaningful way prior to the holding of public hearings.

A further document outlining DFO's overall Position Statement on the acceptability of the Hibernia Development Project will be transmitted to the Panel prior to the holding of public hearings.

B. OVERVIEW OF MAJOR CONCERNS AND ISSUES

ADEQUACY OF INFORMATION

1.0 ADHERENCE TO GUIDELINES

The overall review of the EIS for compliance to set guidelines was difficult given that 1) there were two sets of guidelines (federal and provincial) issued for the EIS, 2) the guidelines were issued 4 - 5 years ago, and 3) there is no specific reference to guidelines in the EIS. In spite of the inherent difficulties under which the proponent was working respecting adherence to guidelines, one would have expected to see considerable cross-referencing to the guidelines in the text of the EIS. The several major noted deficiencies of the EIS with respect to the requirements of the guidelines leads one to question the role of the guidelines in this exercise.

2.0 BASELINE BIOPHYSICAL DESCRIPTIONS

Generally, Volume IIIa provides "snapshots" of the existing biophysical setting of the Hibernia Project. Most relevant literature and data sources have been assessed and resulting descriptions of biotic and abiotic components of the Grand Banks ecosystem(s) are acceptable, with some notable exceptions (i.e. planktonic organisms, wave climate, and marine chemistry).

While the various shipboard and aerial surveys conducted by the proponent in 1980-81 add significantly to our knowledge of the Grand Banks, they could have added much more if experimental design and focus were tighter. This is especially true of the biological oceanography studies. In many cases, valuable information, data gaps, limitations, and conclusions found in contracted studies never made it into the EIS (i.e. food webbs, fish biology, marine chemistry, energy flow, microbiota, and zooplankton).

While a reasonable attempt was made to understand and describe the ecosystem(s) of the study area, the results are somewhat superficial. There is difficulty seeing how the information on ecosystem processes, mechanisms, linkages, pathways, etc., was actually used in impact prediction given that the methodology used focused on generalized population impacts.

In summary, the general, superficial treatment given the biophysical components all but negates any possibility for concise, specific impact prediction. Particularly contributing to this deficiency is the real lack of any understanding of the limits and sources of natural variability in biotic components. This deficiency is critical given that the proponent heavily relies on the phenomenon of natural variability to generally dismiss the likelihood of impact at the population level.

IMPACT ASSESSMENT METHODOLOGY

3.0 ECOLOGICAL APPROACH

The federally-produced EIS guidelines clearly require an ecological approach to impact prediction by stating that "This section should include the impact of the project on . . . and upon the ecological interrelationships between the major species or groups of species at different trophic levels . . .". From the information provided in the EIS, it is difficult to ascertain compliance with this requirement.

The approach taken in the EIS towards assessing impact based on ecosystems is ill-defined. It appears that impacts of project attributes on ecosystems were rated in a manner directly proportional to the impact rating assigned to component populations or species. Size is not the only attribute of a population that has implications for the larger unit; population structure and function are also important and should have been included in the assessment of ecosystem impacts. In addition, biological relationships among ecosystem components are characteristically non-linear and multiplicative rather than additive.

4.0 SCOPING OF ISSUES

The impact assessment methodology purports to have used the recently developed concept of "Valued Ecosystem Components" to arrive at critical and sensitive environmental components for the impact matrices (VEC are chosen on the basis of ecological, social, and economic importance). A quick glance at any of these matrices will show that, in fact, VEC were not identified but rather it is the classical "shotgun" approach to impact prediction that results. The originators (Beanlands and Duinker) of the concept clearly point out that VEC are chosen through a rigorous process of scoping involving the proponent, government, academia, and the public. To the best of our knowledge no such formal exercise was conducted as part of the Hibernia EIS.

5.0 IMPACT DEFINITIONS AND RANKING

By focusing at the population level of ecological organization in its impact prediction, the proponent has developed an ill-conceived ranking scale. In that scale, a "major" impact affects a whole population or species for several generations. As a result, there are no fish-related impacts rated above "minor".

In making impact predictions at the population level, a number of basic assumptions are made which all but ensure the "nil or negligible" impact ratings that dominate the impact prediction matrices in the EIS. The most critical of these assumptions concerns the concept of natural variability and the inherent problems associated with detection of impacts as distinct from natural fluctuations. While relying heavily on the concept to arrive at largely insignificant impacts at the population level, it is interesting to note that there are virtually no estimates of natural variability offered for any of the populations identified as key environmental components.

6.0 RECOGNITION OF, AND ACCOUNTING FOR, UNCERTAINTY

In making impact predictions, the proponent provides little or no suggestion that any of these impact predictions have any uncertainty associated with them. This deficiency is a logical consequence of not having addressed uncertainty in the baseline descriptions of environmental components and their ecosystems. The lack of rigor in setting boundaries also contributes to the overall feeling of certainty. Only in the case of the Zone of Influence of Discharges is there any attempt to set boundaries and in this case the process used is unclear. By focusing on impact at the population level, the proponent relies largely on the acute toxicity literature to the virtual exclusion of the significant literature on ecotoxicology. As a result, cause-effect relationships resulting from multiple sublethal effects are largely ignored. This further contributes to the false sense of certainty shown in impact predictions. The literature suggests that multiple sublethal effects may operate in a multiplicative rather than additive way, resulting in acute impacts not detected when focusing on single toxicants. Hence the confidence (and probable error) shown by the proponent in predicting additive and repetitive impacts.

Risk assessment recognizes the inability to make impact predictions in a deterministic way with absolute certainty. The classical methods used in this EIS ignore the importance and pervasive nature of ecological uncertainty. Ecological risk assessment depends, in the first instance, on the availability of a good engineering risk assessment (a deficiency in this particular EIS). Ecological risks are then determined given the probabilities of various events (i.e. spills, upsets, collisions, etc.) as they are translated into ecological consequences. In the process, uncertainty is quantified and evaluated in a rigorous, objective way. Ecological risk assessment could get us away from the types of statements of complete certainty seen in the Hibernia EIS which reflect an assumption that the ecosystem we are dealing with is completely understood and therefore there is no room for uncertainty. DFO would like to see risk assessments done on selected Valued Ecosystem Components focusing at the individual and population level.

7.0 CUMULATIVE IMPACT ASSESSMENT AND AREA-WIDE ASSESSMENT

Clearly as proponent, Mobil Oil Canada is responsible only for assessing the impacts of a single project on the Grand Banks and not the overall level of development that might be possible (and stimulated by Hibernia) in years to come. Given the possibility of development of additional oil fields on the Grand Banks, and the expectation that impact prediction would continue to be conducted on a case-by-case basis, there is widespread concern that cumulative impact will not be considered. The lack of area-wide impact assessment to examine cumulative impact of a number of developments over time is a major deficiency, generally, of our efforts to predict impact for offshore oil and gas development. The need for area-wide, cumulative impact assessment is obvious; who is to have the

responsibility for this action and the actual methodologies to be employed remains to be resolved by decision makers.

EFFECT OF THE ENVIRONMENT ON THE PROJECT

8.0 PROTECTION OF SEABED COMPONENTS FROM ICEBERG-RELATED DAMAGE

The proponent tells us that final decisions respecting the protection of seabed components of the project (i.e. wellheads, flowlines, gathering lines, production and riser base manifolds, transfer lines, etc.) from iceberg scour, and resulting damage, have yet to be made. We are further told that trenching, burying, use of silos and glory holes, etc., may not be necessary as components can be designed to be sacrificial or quickly purged of oil in the event of imminent threat. While we recognize the inherent increased cost in protecting such structures, we are of the opinion that cost alone should not be the determining factor. We are especially of the above opinion given the lack of any detailed risk assessment and probabilities of incidents resulting in damage leading to loss of produced fluids.

9.0 ENVIRONMENTAL DESIGN PARAMETERS

With the exception of waves, DFO generally believes that the various environmental design parameters presented in the Project Description are adequate. We are concerned, however, over the lack of confidence limits (or degree of uncertainty) attached to these parameters. These would help to identify data gaps or shortcomings in our knowledge. While some of the necessary information can be gleaned from a careful review of the Physical Environment sections of Volume IIIa, the underlying supporting information should be provided in a single, concise manner in Volume II.

10.0 WAVE CLIMATE

Modern requirements for spectral wave information in the design of offshore structures and vessels have evolved rapidly over the past decade. These requirements are used to assess survivability, operational considerations, and in fatigue calculation (LeBlond, et al. 1982).

In view of the importance of quantifying wave information, as noted above, how well has the EIS addressed this?

10.1 Effects of Breaking Waves

The EIS deals with the effects of breaking waves in two sentences: "Waves breaking is one of the most difficult aspects of water waves to quantify. Systematic measurements of wave breaking in deep water are extremely difficult because of instrumental constraints and little is known of their statistical properties."

The Inquiry into the loss of the Ocean Ranger (Report 1 of the Royal Commission on the Ocean Ranger Marine Disaster, 1984), on the other hand, indicates that quite a lot was already known about the effects of breaking waves on seaborne structures, and the everyday seaman's experience attests to this.

The above indicates, first, that consideration of the effects of breaking waves on rig structures is critical in their design; second, that it tends to be ignored, both by marine design engineers and those who prepare Environmental Impact Studies; and third, that the statement "little is known of their statistical properties" is at best misleading (see detailed notes, section C).

10.2 Wave Hindcast Scenarios

Table 3.3.1 gives, for 100-year return period waves, the following estimates: maximum height 30.5 m; significant height 14.9 m; peak period 16 s. These are not observations, but extrapolations from "field or hindcast data" using "standard statistical methods". The numbers for wave height are close to those presented in Table 3.1-14, which result from a hindcast study by Oceanweather Inc. published in 1982 based on "the 18 most severe storms in the period 1951 through 1980." Under "Observed Extreme Conditions", the most severe storm was that of February 14-18, 1982, during which the Ocean Ranger capsized, for which "the storm sea state reached a significant wave height of 12.7 m with a peak spectral period of 15.2 s". The conclusion stated in Table 3.3.1 is, therefore, that the worst-case scenario is in fact not very different from that of the Ocean Ranger storm. The conclusion is based entirely on past wave data and wave hindcasts from past storm data.

The Mobil study carried out by Oceanweather Inc. identified 20 severe storms which were hindcast for use in an extreme value procedure to estimate the 100-year return period significant height. The hindcast values for significant height ranged from 6.3 to 12.18 metres. Two storms which yielded heights of 6.3 and 7.1 metres were then dropped from further consideration on the grounds that it was likely more severe storms had occurred. (It is generally required in extreme value analysis that the most severe set of storms be utilized.) There then remained 18 storms with significant heights ranging from 7.79 to 12.18 metres. It is our opinion that this set of storms still does not represent the 18 most severe storms in the time period examined.

An ESRF study was carried out by the MEP Company in 1984 to identify the 30 to 50 most severe storms in each of seven east coast areas. For the Grand Banks area, 34 severe storms were identified. Only 9 of these were common to the Oceanweather study. Of the remaining 25 severe storms identified by MEP, at least 14 demonstrated, according to the criteria applied, more severe wave generating potential than some of the storms used in the Oceanweather study. In addition, there have been at least two storms since 1980 which featured measured waves in excess of the largest significant height hindcast in the Oceanweather study.

In addition, it is not uncommon to measure peak periods of the spectrum of 17 seconds or greater in severe east coast storms. MEDS has quite a few such measurements on hand. For example, the period reached 17 seconds in the Ocean Ranger storm, which is estimated to have been a 5- to 10-year event only.

It is therefore recommended that Mobil reassess the Oceanweather study, taking into account the MEP study on severe storms and those severe storms which have occurred since 1980. It is further recommended that the design value of 16 seconds for the peak period of the spectrum be reconsidered in the light of measurements made to date.

11.0 ICEBERGS

One of the most important environmental attributes of the Hibernia region is the presence of sea ice and icebergs. Pack ice and icebergs move in response primarily to random forcing by winds and ocean currents. This response, in turn, depends on characteristics of the pack ice or iceberg. These factors can introduce a high level of randomness in the distribution and trajectories of sea ice and icebergs which will be difficult to predict consistently. At best, probability forecasts can provide an estimate of the probability of a certain event occurring. The probability of collision of an iceberg with a fixed structure, in the absence of towing or relocation of the structure, although not explicitly stated, can be estimated to give 1.3 probable collisions with a fixed structure during a 20-year period. This value is probably conservative because (a) recently increased surveillance suggests that previous estimates of numbers of icebergs were on the low side, and (b) the estimate is based on each iceberg drifting uniformly through the region of interest, while observed iceberg tracts tend to be contorted and sweep more area than a straight tract. On the other hand, some collisions would involve a glancing blow, or a small iceberg, or an iceberg travelling at below average speed and so might be less hazardous.

At present, most of the design parameters used have been based on large bergs travelling at near the maximum surface speeds. However, we know that smaller ice masses, such as growlers and bergy bits, can develop more momentum in high seas than the drifting berg of large size. When combined with our comments on waves, it seems that the assessment of the effects of ice on the fixed or floating structures have not been done well.

EFFECT OF THE PROJECT ON THE ENVIRONMENT

12.0 ROUTINE DISCHARGES

12.1 Produced and Storage Displacement Water

Routine discharge of untreated storage displacement water having a hydrocarbon level of 10-35 ppm is a feature of the Fixed Production

Facility. (It is not clear why this is not a feature of the Floating Production System.) Based on our calculations, using discharge values provided in the EIS, we estimate an average loading of about 500 kg of oil per day - not an insignificant amount. We assume that the concentrations given in the EIS are based on production experience elsewhere, but this is not referenced. There is little or no consideration of oily storage displacement water as an environmental irritant, even though its discharge per day of total hydrocarbon approximates that of produced water.

Based on produced water discharge volume and hydrocarbon concentration data provided in the EIS, we calculate that approximately 500-600 kg of hydrocarbons will be added daily to the ocean during full production (fixed system or phase II of floating system). Together with some 500 kg of hydrocarbons from discharged storage water, the total loading will approximate 1000 kg/day. Vertical mixing and lateral dispersion of these effluents will be determined by depth of release, especially during summer when thermal stratification of the water column could retain the hydrocarbons above the thermocline for extended periods. If this was to happen we would be very concerned about the effect on pelagic organisms, especially larval fish. The resulting impact upon benthic organisms notwithstanding, DFO would prefer to have both effluents released at a depth below the summer thermocline.

12.2 Oil-Based Drilling Muds

From information contained in the EIS it is not clear whether cuttings containing oil-based drilling muds will be routinely "washed". It is further not clear whether the "20% oil by weight" represents washed or unwashed cuttings. If cuttings are discharged with this level of oil, a simple calculation suggests a discharge of 3 tonnes of aromatic hydrocarbon per well. This seems extremely high in view of the universally-experienced low concentrations of aromatic hydrocarbons in sediments "downstream" of wells utilizing low-toxicity, oil-based muds. This should be clarified.

12.3 Cumulative and Additive Impact from Routine Discharges

The EIS generally considers cumulative and additive impacts from routine discharges to be nil or negligible for most aquatic organisms during the Operation and Maintenance phase. DFO feels that this conclusion, based largely on acute toxicity data and consideration of impact only at the population level is underestimating the situation and is misleading. Ongoing discharges of hydrocarbons, chlorine, biocides, solvents, acids/bases, etc., will effect organisms in a multiplicative rather than additive way, possibly resulting in acute impacts not forecasted when focusing on single toxicants. In our estimation, there is insufficient knowledge of the phenomenon to dismiss it so lightly. This whole area should be highlighted as a deficiency or information gap for the purpose of impact prediction.

13.0 MAJOR SPILL INCIDENTS

13.1 Major Spill Scenarios

In our review, we have expressed concern for what appear to be overly-optimistic portrayals of worst-case spills anticipated during Operation and Maintenance. In that regard, we question the choice of 90 days as the period required to drill a relief well in the event of a blowout. Given the harshness of Hibernia winter conditions, and recently experienced problems in relief well drilling on the Scotian Shelf, we believe 90 days to be optimistic. We further question the use of 30,000 m³ as representative of a worst-case batch spill. In the absence of any statistical information on storage batch spills, the proponent assumes the loss of contents of a single storage compartment or shuttle tanker tank as worst case. Worst-case batch spills should consider loss of all stored product.

13.2 Predicted Impacts from Major Spill Incidents

In terms of worst case, the proponent correctly identifies a surface blowout occurring in summer as potentially the most damaging. We are concerned, however, that predictions of impact may be understated, particularly for larval fish and benthic organisms (especially Mesodema) on the Southeast Shoal. Larval capelin and yellowtail flounder in the area of the Southeast Shoal may be particularly vulnerable. We base our concern on a number of factors as follows.

Trajectory modelling suggests a surface blowout in summer or winter would likely result in oil over the Southeast Shoal and the Shelf-break area on the Nose and Tail of the Grand Bank. These areas are critical for larval fish production. There is evidence, from slick behaviour study, that large areas of the Grand Bank could be covered with oil, albeit not continuously. The summer thermocline would retain oil in the upper 50 m or so and concentrations approaching lethal (i.e. up to 3 ppm) would be found in the surface waters.

We believe the proponent's optimistic impact predictions are made without taking into account the full areal extent of contamination and expected high ppb to low ppm concentrations of oil in the upper layers of the water column.

13.3 Assessment of the Transportation Component of the Project

The guidelines produced by the federal government state clearly that the transportation component of the project should be fully assessed. Page 6 states that "The proponent should provide a brief description of the major development/production/transportation strategies and technologies considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits and environmental risks of the alternatives. Significant differences in

impacts among the alternatives considered should be described." The proponent clearly has not addressed that requirement as evidenced by 1) not considering impact from tanker spills outside the immediate Hibernia area, and 2) not considering the "pipeline option".

In the first instance, the EIS should consider the selection of shipping routes which would minimize risk to biota if a tanker accident were to occur. In the second case, it is widely known that the proponent has considered the costs, benefits, and environmental risks associated with at least two potential pipeline routes and landfalls on the southern Avalon Peninsula, yet these analyses do not appear anywhere in the EIS.

14.0 MITIGATION OF IMPACTS

Mitigation of environmental impact generally requires some very site-specific actions during the design, construction, operation, and abandonment phase of a project. Specific mitigation measures are only possible when detailed engineering design is available. For Hibernia we are dealing with a conceptual design, generalized impact predictions, and very little in the way of specific mitigation. Unless another review mechanism is available prior to project implementation, effective mitigation of Hibernia-related impacts will not be feasible. Development of mitigation measures and evaluation of the effectiveness of same is an ongoing iterative process. A suggested mechanism to ensure effective mitigation is the requirement of acceptably designed Environmental Protection Plans for all phases of project components. Approved Environmental Protection Plans (including implementation strategies) would be prerequisite to final project approval by the principal regulatory agency.

15.0 EFFECTS MONITORING

The federally-produced guidelines for the EIS clearly require detailed consideration of effects monitoring. Page 22 of the guidelines is quite emphatic as follows: "Plans for surveillance and monitoring of environmental effects should also be detailed". Clearly the EIS is deficient in this regard.

Effects monitoring should be designed to test specific impact predictions and mitigation measures. In the absence of specific impact hypotheses and mitigations, design of an effective monitoring program will be difficult.

We strongly disagree with the proponent's stated intention of focusing efforts on benthic organisms and further disagree with any monitoring proposal that focuses on population level impacts. We feel strongly that a suite of monitoring indicators should be chosen with a focus on sub-lethal responses at the individual organisms level. We see MFO induction as one particularly valuable indicator for fin fish. We further feel that a level of effects monitoring comparable to that

implemented for production sites in the North Sea should be put into place for Hibernia.

SOCIO-ECONOMIC IMPACTS

16.0 COMPENSATION TO THE FISHING INDUSTRY

The lack of a compensation scheme for attributable damages is of concern. The lack of a stated policy on fisheries compensation is even more of a concern. In the absence of a final compensation package, the proponent should at least state its policy focusing on areas such as disruption of fishing activity (exclusion, displacement, preemption, etc.), tainting, debris, and secondary effects (i.e. processing). The lack of a stated policy on fisheries compensation is viewed as a major deficiency.

17.0 ABANDONMENT AND SEABED RESTORATION

DFO is concerned that the seabed within the project exclusion zone may not be fully restored at abandonment. There is no commitment to recover all sub-sea components (i.e. flowlines, gathering lines, export lines, production manifolds, etc.), restore the topography of the sea bed to as natural a state as possible, and to consider the technical feasibility of removing the GBS. While we recognize that permanent loss of the exclusion zone to fishing would, in itself, not be unacceptable, we are concerned with precedents being set that could result in significant losses if additional fields are developed.

18.0 TAINING OF FISH CATCH AND PRODUCT

We are of the considered opinion that tainting of offshore catches is a real issue especially with respect to large, episodic oil spills. We further are of the opinion that the issue has been understated by the proponent. Expected concentrations (i.e. high ppb to low ppm) of hydrocarbons in the water column, especially following a blowout or large batch spill, would be of a level to cause tainting of fish. In the case of a worst-case spill lasting several months, large areas of the Grand Banks could be effected resulting in major impacts upon Canadian offshore fisheries and their markets, both local and international. We believe a more thorough treatment of the subject is warranted in the EIS.

19.0 PREEMPTION OF FISHING ACTIVITY BY A MAJOR OIL SPILL

Given the extensive duration and areal extent of a worst-case oil spill (i.e. summer blowout), we are of the opinion that large areas of the Grand Bank could be affected by slicks until the flowing well bridged naturally or was brought under control. Given the present system of enterprise allocations (company quotas), the suggestion by the proponent that vessels can simply relocate to other grounds may not be feasible.

The resulting impact on the processing sector (i.e. employment and market commitments) have not been fully addressed. The impact upon seasonal processing plants would be most severe.

20.0 LOSS OF ACCESS DUE TO EXCLUSION ZONE

While we generally concur that the impact upon the fishing industry from preemption of fishing within the project exclusion zone will not be unacceptable, we do consider that the estimated effort and catch within the zone may be understated given that data used are representative of post-Hibernia discovery and delineation drilling.

21.0 DEMAND FOR FISHING INDUSTRY LABOUR AND WAGE ESCALATION

The proponent's predictions of little significant impact on skilled labour within the offshore harvesting section (i.e. captains, mates, engineers, etc.) is probably accurate. We do not concur, however, with the suggestion that impacts upon the skilled work force associated with trawler refit centres (especially Burin) will be minor. Even short-term disruptions could be critical. We further believe that the EIS fails to address the issue of potential wage escalation in the processing sector and the probable negative effect on employment if the industry responds to this pressure by increased mechanization.

C. DETAILED TECHNICAL COMMENTS

VOLUME II - PROJECT DESCRIPTION

This Volume provides an adequate conceptual description of the development proposal including the two production modes under consideration, and it is recognized that many project details have yet to be finalized. While we accept the conceptual nature of the project description and the associated predictions of impact as part of a planning process, it must be recognized by the proponent that impact predictions and mitigations, based on the the present conceptual design, construction and operation, may not be valid when new information or firm plans are known.

In this regard, the early availability of detailed environmental design parameters, engineering risk assessment and the resulting engineering design for the various marine components of the project is critical to the final, detailed consideration of environmental risk, mitigation and monitoring. We are under the impression that once the proponent decides on the preferred development mode, the pertinent information will be made known to government in the Project Development Plan scheduled for submission in mid-September. As one of the Departments of government having a "need to know", DFO is concerned about the scheduling and timing of submission of the Development Plan. Normally, the Development Plan is submitted following completion of the EIS review and Panel report, thus allowing for the incorporation of various mitigative measures into the Plan. The present schedule would negate this.

2.0 RESERVOIR GEOLOGY AND ENGINEERING

2.3 Development and Production Strategy

2.3.1 Floating Production System

---p. 17

Alternative gas-handling schemes are referred to in the event that reservoir re-injection is not feasible, however, specifics are not given. One assumes that flaring is one possibility; would production be considered? If the latter is a possibility at all it should be amplified in the Project Description (it is referred to superficially on p. 39).

3.0 FIELD DEVELOPMENT SCENARIOS

3.1 Floating Production System

3.1.1 Satellite Wells

---p. 20

It is suggested that a final decision is yet to be made on whether or not to have sub mudline wellheads. There is a suggestion that wet-tree wellheads at the sea floor could be acceptable because the risk of iceberg scour is low. The fact that there is a risk of scouring, however low, should lead to a decision favouring sub-mudline completions.

3.1.2 Subsea Production Facilities

---p. 21

As is the case with well completions, no decision has been made to trench flowlines and gatherlines or to place production and riser base manifolds in silos or glory holes to avoid iceberg contact. As was suggested above for satellite well completions, the fact that a risk from iceberg scour exists should lead to a decision to protect these sub-sea components.

3.1.5 Floating Storage Vessel

---- p. 23

Reference is made to possible "processing equipment for oil dehydration and water treatment." It is not clear, however, if these facilities would be used to treat production water or storage displacement water or both. This should be clarified. If oily storage displacement water is anticipated, the proponent should state whether or not it will be treated. (Table 4.4-1 suggests by omitting any reference to it, that there will not be any storage displacement water).

3.2 Fixed Production System

3.2.1 Development Wells / 3.2.2 Subsea Production Facilities

--- p. 24

Concerns previously expressed for damage to sub-sea components from iceberg scour and the need to minimize the risk by placing same below the anticipated scour depth (i.e. 1.6 m) are repeated for the Fixed Production System. It is recognized that the risk is lower using the Floating System given that less wellheads, flow lines, manifolds, etc. are exposed.

3.3 Technical Feasibility in the Hibernia Environment

There is no overall engineering risk assessment on which to evaluate the two modes of development. While the concept of risk is used fairly frequently (and loosely) in Volume II, it would appear that there has not been a thorough engineering risk assessment conducted to date. Yet we are told that the proponent will be making known its preferred development mode by August 15, 1985 (three months after receipt of an EIS whose project description is conceptual!). Surely, a comprehensive engineering risk assessment must have been done by this time, or at least was well underway at the time of release of the EIS. Yet there is no reference to this exercise per se.

3.3.1 Environmental Parameters

--- p. 26-28 (Table 3.3.1)

It would have been helpful to have had some degree of uncertainty attached to these design parameters, where possible, so that data gaps or shortcomings are more evident. Thus, it seems important to know whether the estimate of the maximum 100-yr wave, given as 30.5 m, is within 0.05 m or within 3.0 m.

- A more precise definition of "near seabed speed" would have been illuminating.
- The minimum temperature given as -2.54°C seems too low. Minimum seawater temperature at 35 parts per thousand is -1.9°C .
- One of the important environmental attributes which separates the Hibernia area from areas such as the North Sea is the presence of sea ice and icebergs. The maximum iceberg kinetic energy is given as $1.48 \times 10^9 \text{ N.m}$ but little rationale is given on how these numbers were arrived at. Note that this value of kinetic energy may not be particularly meaningful as the probability distribution of iceberg mass and velocities were not evaluated and used in this calculation. Why was kinetic energy calculated/used and not momentum? What is the significance of this value in terms of impact assessment, mitigation measures (i.e. towing, etc.).

In view of the importance of environmental design-criteria (especially those relating to ice) in engineering design of project components and risk assessment, the underlying, supporting information should be provided in a concise manner in this Volume.

--- p. 28 (Table 3.3-2):

Because of topographic refraction and horizontal current shears in the Grand Banks region, wave fields may be different from those observed in the North Sea.

3.3.3 Oceanographic Considerations

--- p. 30:

Turbulence levels or dispersion rates should have been included in this list of important oceanographic considerations.

--- p. 31 (3.3.3.7):

In reference to the 60 percent ice cover as an operational limit, it should be stated whether the 60 percent refers to the immediate local (i.e. platform) area or a broader regional area. Implementation of this 60 percent ice cover ceiling for operations implies a fine scale predictive capability for ice dynamics (i.e. increasing ice cover due to convergence). What is the current capability?

--- p. 33 (3.3.6.4 and 3.3.6.7)

Placement of transfer lines on the seabed without trenching increases the risk of an oil spill. Given that a risk of iceberg impact exists, the trenching option should only be rejected if shown to be prohibitively costly.

3.6 Other Production System Options

3.6.3 Oil Transportation System Option

--- p. 39

The federally-issued EIS guidelines state that "The proponent should provide a brief description of the major development/production/transportation strategies and technologies considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits and environmental risks of the alternatives. Significant differences in impacts among the alternatives considered should be described." The proponent clearly has not addressed this requirement in his consideration of the "pipeline option." It is widely known that the proponent has considered the costs, benefits, and environmental risks associated with at least two potential routes and landfalls on the southern Avalon Peninsula, yet these analyses do not appear anywhere in the EIS.

3.8 Regulations, Codes and Certification

3.8.1 Approval Process

--- p. 41

Given that the EIS consists of a conceptual project description and resulting generalized impact predictions and mitigations, and given that

the EIS is really only a planning document, there is a need for Environmental Protection Plans to be in place at the final approval stages of the project to ensure that specific impacts are mitigated.

4.0 FIELD FACILITIES

4.1 Topside Facilities

4.1.1 Process Systems

--- p. 45 (4.1.1.3):

It is understood that 40 ppm oil in discharged produced water meets existing federal regulations. It is further understood that 40 ppm reflects an average value given that upset conditions will periodically occur (see Tables 4.4-1 and 4.4-2). The proponent should identify whether 40 ppm represents a daily, weekly or monthly average and what the allowable percent exceedence and its frequency is. It should also be clearly stated what the 40 ppm represents (i.e. total hydrocarbons, water soluble fraction, etc.) and its method for determination.

4.1.2 Ancillary Systems

--- p. 49 (4.1.2.13):

From the description of the ballast system in the GBS production platform it is not clear what role the storage displacement water plays other than maintaining the storage cells at full volume. One assumes that the storage displacement water also has a ballasting function, albeit perhaps a minor one. This should be explained. One assumes that there will be no treatment of this oil-contaminated water because it meets existing regulations for oily water discharge. If this is the case it should be stated, together with supporting evidence, that hydrocarbon levels will not exceed existing compliance standards.

4.4 Facility Emissions

--- p. 63 (Table 4.4-3):

The suggested worst-case spill for a floating storage vessel is 30,000 m³ yet the overall capacity of the storage vessel is 150-200,000 m³. What does 30,000 m³ represent - a single storage compartment, perhaps (This is the impression given on page 69, Volume IIIb)? This should be explained and rationalized. The worst-case spill from a sub-sea pipeline is given as 300 m²; this is a typographical error obviously and should be 300 m³. It is not clear what this spill represents. For instance, is it the contents of a single gathering or flow line? Is it the contents of a single transfer line perhaps? This needs to be clarified.

--- p. 64 (Table 4.4-1):

It is suggested that cuttings using oil-based mud will be discharged with 10-20% oil on same. On page 63 it is suggested that "When necessary, borehole cuttings will be washed." Does 10-20% oil represent washed or unwashed cuttings? What criteria will be used to determine if washing of cuttings is necessary?

Further to this question, it is not clear if "10-20% oil on cuttings" refers to percentage by weight. If it is, and we assume a density of about 1.5, this represents a discharge per well of 3×10^5 kg of cuttings. Taking a worst-case view (i.e. 20% oil content of which 5% is aromatics), this is equivalent to a discharge of 3×10^3 kg of aromatics (i.e. about 3 tons of aromatic hydrocarbons per well). If this is the case, the routine discharge is by no means trivial in total, even if the concentrations appear to be low.

Similarly, produced water containing 40 ppm oil may be released at up to 14×10^3 m³/d; this corresponds to a daily release of 560 kg or about a half a ton. The point is made, as per above, that these routine releases are by no means trivial.

--- p. 65 (Table 4.4-2):

The routine discharge of a maximum of 32,000 m³/day of storage displacement water having 10-35 ppm oil is of significant concern. The quantity of produced water is given as 14.3×10^3 cu m³/well; this represents a typographical error and should read m³/day. If we assume maximum discharges of 32,000 m³/day and 14,300 m³/day for storage displacement water and produced water, respectively (at 10-35 ppm and 40 ppm, respectively) the net effect of discharge of storage water is to more or less effectively double the hydrocarbon loading to the ocean that would result from release of produced water only.

5.0 CONSTRUCTION AND COMMISSIONING

5.1 Construction Approach

5.1.2 Fixed Production System

--- p. 72

The requirement for 290-300,000 tonnes of aggregates has the potential to severely damage freshwater and/or marine habitats. The identification of a potential source of sand at Piper's Hole River elsewhere in the EIS is a cause for concern. The Department of Fisheries and Oceans should be kept informed during the process of identifying potential sources of aggregates.

6.0 DEVELOPMENT DRILLING

6.2 Drilling Facilities

6.2.2 Equipment and Systems

--- p. 87

The impression is given here that a cuttings washing system will be in place if oil-based muds are used. Earlier in this volume (p. 63) one is left with the impression that this is not yet decided. The situation should be clarified.

7.0 OPERATION AND MAINTENANCE OF PRODUCTION FACILITIES

7.1 Operations

7.1.5 Environmental Response Plan

--- p. 95-96 (Table 7.1-1 and 7.1-2):

In the event of an approaching iceberg, flowlines and gathering lines at risk would be purged of oil. There is no indication that transfer/export lines, production risers and loading risers would be purged as well even though one is left with the impression elsewhere in this Volume (i.e. p. 22) that this is possible.

8.0 ABANDONMENT

8.2 Floating Production System

--- p. 100:

The impression one is left with here is that sub-sea components such as flowlines, gathering lines, export lines, production manifolds, etc. would be purged of oil and abandoned on the sea floor. However, on page 249 of Volume IV we are told that these components may be removed, buried, or retrieved. Unless technically impossible, the latter approach should be taken to ensure that abandonment returns the sea floor to a "trawlable" condition.

There is no mention of levelling trenches, filling glory holes, smoothing spoil heaps, etc. as part of the abandonment procedure, in spite of reference elsewhere (p. 251, Volume IV) that not doing this would pose a problem for fishermen's otter trawls.

The above stated concerns with respect to abandonment procedures apply equally to the Fixed Production System.

8.3 Fixed Production System

--- p. 101:

The stated intention is to leave the GBS basically as is (with removal of re-usable topside components) on the sea floor. No reference is made to the possible de-ballasting of the structure and subsequent reuse or deep-ocean disposal. The proponent clearly stated in one of the Community Information Sessions that this is possible in theory. The EIS should examine in some detail, the technical considerations and costs involved in such an operation.

10.0 ENVIRONMENTAL AND OPERATIONAL MONITORING

10.1 Environmental Monitoring

10.1.3 Iceberg and Sea Ice

--- p. 110:

Does the ice management program include plans to use the recent Garrett (1984) model for iceberg movement prediction? (Garrett, C.J.R., Iceberg Res. 7, 3 (1984))

11.0 SAFETY AND CONTINGENCY PLANNING

11.2 Risk Assessment

--- p. 116:

It cannot be denied that development of the Hibernia oil fields involves risks which presumably the developer tries to reduce to an acceptable level. The question which must then be raised is "what is an acceptable level of risk?" In many cases this document fails to define what is considered acceptable while more could have been done to quantify the risks which have been identified. For example, a gravity based structure would appear to be best suited to withstand the harsh environmental conditions which can be expected in the Hibernia region. However should such a structure fail, the outcome could be more catastrophic than might occur in the event of failure on a floating platform. In defining an acceptable risk there must be a trade off between the actual risk of failure and the consequences. This is by no means a trivial problem since failure may result from one or more factors, therefore involving joint probabilities of occurrence of a number of events which may not necessarily be independent. For example, bergy bits will be more hazardous to a floating platform in heavy seas than under calm conditions. The study under review tends to avoid addressing these problems beyond a very qualitative and descriptive view.

Appendix A

A.1 Applicable Legislation

--- p. 128:

Reference to fish habitat provisions of the Fisheries Act should include physical disturbance as well as pollution.

The Newfoundland Fishery Regulations made pursuant to the Fisheries Act require formal application for Authorization for any works or undertakings having the potential to affect fish habitat. A particular feature of this Authorization relates to the use of explosives in fish-bearing waters.

VOLUME IIIa - BIOPHYSICAL ASSESSMENT

1.0 INTRODUCTION

1.1 Objectives and Organization

--- p. 2:

The opening sentence states that the Biophysical Assessment describes the natural environment of the Hibernia Development Project. This is done in such a superficial way that it would be impossible to determine specific impacts which are of natural occurrence from those of oil related development since there is no estimate of the natural limits of variation of the factors which are being influenced by environmental and biological events.

1.3 Data Sources and Supporting Studies

--- p. 4-5:

In Table 1.3-1 there is no specific reference to Supporting Baseline Studies regarding the Biology of Fish in the study area. This appears to be a glaring omission in this document. There is a report entitled "Fish and Fisheries" by NORDCO (Table 1.3-2) but this deals mainly with the commercial fishery and the effects of physical displacement of fishery operations. There is no definitive study of the fish biota and the factors influencing recruitment, spawning success, density-dependent growth, fecundity, age, and growth per se. These are subjects which have to be addressed when impacts of oil-related development are being assessed. The effects of oil are probably insidious and not always bound to manifest themselves in some starkly outlined impact except in the case of mass mortality.

3.0 REGIONAL ENVIRONMENTAL SETTING

3.1 Physical Environment3.1.2 Physical Marine Environment

These sections contain background climatological information and data sources and summaries of extreme environmental conditions. The former is comprehensive and the latter appears to give reasonable answers for the design parameters but tends to understate extreme wave climate events.

--- p. 37 (3.1.2.3):

Generally, this section presents an adequate description with a few minor errors. In the introduction, they state that "Knowledge . . .

provide insights . . . mixing processes . . ." They did not use the data to estimate what exchange or mixing between the Hibernia or other areas might be. One would have thought that exchange/mixing rates would be important in assessing impacts from this development.

--- p. 51 (3.1.2.4):

It is not clear in Table 3.1-10 if the values represent the extreme wind driven current or extreme total current. For example, Petrie (1982) using current meter data, and defining total current as the sum of wind induced plus mean plus tide, reported the maximum to be 130 cm/s.

If Table 3.1-10 is only wind induced, then $125 + 30 + 4 = 159$ cm/s (Tidal + Mean, Seaconsult). It would be interesting to know the largest discrepancy of Evans-Hamilton model versus data. The 1981 study by Evans-Hamilton shows underestimates by 30 cm/s in peak v component. Too bad they did not show rate or if $125 = \text{Total}$; then wind = 91 which seems low. Regardless, in Vol. 2, p. 27, they use 2.0 m/s. Is 2.0 m/s the working value? I would assume it takes precedence over Table 3.1-10.

--- p. 54 (3.1.2.7):

The discussion of internal waves seems a bit weak. Surface manifestations of internal waves can be seen in SAR images; assuming their dynamics are similar to those observed along the Scotian shelf, could they be a problem for operations?

--- p. 54 (3.1.2.8)

The Mobil EIS deals with the effects of breaking waves in two sentences: "Wave breaking is one of the most difficult aspects of water waves to quantify. Systematic measurements of wave breaking in deep water are extremely difficult because of instrumental constraints and little is known of their statistical properties."

The Inquiry into the loss of the Ocean Ranger (Report 1 of the Royal Commission on the Ocean Ranger Marine Disaster, 1984), on the other hand, indicates that quite a lot was already known about the effects of breaking waves on seaborne structures, and the everyday seaman's experience attests to this. The Ocean Ranger enquiry concluded (see p. 88 of Report 1) "There is no doubt that the breaking of this portlight (portlight #4 in the Ballast Control Room), sometime between 7:45 and 8:00 p.m., was the first link in the chain of events leading to the loss of the Ocean Ranger. Evidence indicated that the thickness of the glass, as specified on the plans furnished by the supplier of the portlight, was insufficient to withstand the wave forces under predictable extreme storm conditions and, moreover, that as the glass aged, pitting of its surface by water-borne or air-borne particles would diminish its strength. In addition, the installed glass failed to meet even the standard of thickness specified on the plans."

Evidence for the wave forces on the glass came from a textbook: Horikawa, K., "An Introduction to Coastal Engineering" (U. of Tokyo Press, 1978): pp. 97-100. In addition to the basic engineering work, wave breaking statistics have been extensively documented. A recent reference is Monahan and MacNiocaill, 1985. The theory is also at the stage where it is useful to the design engineer (see Longuet-Higgins, 1985).

The above indicates, first, that consideration of the effects of breaking waves on rig structures is critical in their design; second, that it tends to be ignored, both by marine design engineers and those who prepare Environmental Impact Studies; and third, that the statement "little is known of their statistical properties" is at best misleading.

Waves break most often when they are growing rapidly in intensifying storms (their growth rate depends on the height of the existing waves, while the rate at which they can lose energy to dissipation and through nonlinear transfers to other frequencies is not such a strong function of their height). When they break, the water velocities in the breaking regions reach the phase velocity $gT/2\pi$ of the waves, where g is the acceleration of gravity and T is the wave period (for 17 s waves, $gT/2\pi = 26.5$ m/s, or 53 knots). Thus, since the expected forces vary as the square of the water velocity, and since long-period waves are the highest at breaking, it is the long-period waves which can be expected to do the most damage.

--- p. 57-64 (3.1.2.8):

Table 3.3.1 gives, for 100-year return period waves, the following estimates: maximum height 30.5 m; significant height 14.9 m; peak period 16 s. These are not observations, but extrapolations from "field or hindcase data" using "standard statistical methods". The numbers for wave height are close to those presented in Table 3.1-14, which result from a hindcast study by Oceanweather Inc. published in 1982 based on "the 18 most severe storms in the period 1951 through 1980." Under "Observed Extreme Conditions", the most severe storm was that of February 14-18, 1982, during which the Ocean Ranger capsized, for which "the storm sea state reached a significant wave height of 12.7 m with a peak spectral period of 15.2 s". The conclusion stated in table 3.3.1 is, therefore, that the worst-case scenario is in fact not very different from that of the Ocean Ranger storm. The conclusion is based entirely on past wave data and wave hindcasts from past storm data. In one case (the Ocean Ranger storm) where a hindcast could be compared with actual wave data, the hindcast significant wave height was 1.6 m lower than that observed, while no record is provided of the hindcase wave period.

The Mobil study carried out by Oceanweather Inc. identified 20 severe storms which were hindcast for use in an extreme value procedure to estimate the 100-year return period significant height. The hindcast values for significant height ranged from 6.3 to 12.18 metres. Two storms which yielded heights of 6.3 and 7.1 metres were then dropped from further

consideration on the grounds that it was likely more severe storms had occurred. (It is generally required in extreme value analysis that the most severe set of storms be utilized.) There then remained 18 storms with significant heights ranging from 7.79 to 12.18 metres. It is our opinion that this set of storms still does not represent the 18 most severe storms in the time period examined.

An ESRF study was carried out by the MEP Company in 1984 to identify the 30 to 50 most severe storms in each of seven east coast areas. For the Grand Banks area, 34 severe storms were identified. Only 9 of these were common to the Oceanweather study. Of the remaining 25 severe storms identified by MEP, at least 14 demonstrated, according to the criteria applied, more severe wave generating potential than some of the storms used in the Oceanweather study. In addition, there have been at least two storms since 1980 which featured measured waves in excess of the largest significant height hindcase in the Oceanweather study.

In addition, it is not uncommon to measure peak periods of the spectrum of 17 seconds or greater in severe east coast storms. MEDS has quite a few such measurements on hand. For example, the period reached 17 seconds in the Ocean Ranger storm, which is estimated to have been a 5- to 10-year event only.

It is, therefore, recommended that Mobil reassess the Oceanweather study, taking into account the MEP study on severe storms and those severe storms which have occurred since 1980. It is further recommended that the design value of 16 seconds for the peak period of the spectrum be reconsidered in the light of measurements made to date.

A plot was made of the time series of significant wave height and peak period, as determined from "Zapata Uglund" Wave Rider data taken during the Ocean Ranger storm and analyzed by the Canadian Marine Environmental Data Service (Ocean Ranger Commission, Report 1, Table E-5, p. 257. 1984). The resulting graph indicates the presence of significant wave energy at periods of 17 s, at the time the Ranger was in distress, and hence indicates the difficulties involved in quoting wave data. Clearly, to select the "significant period", a computer algorithm chose the highest peak in the wave spectrum from a few, fixed period values (i.e. 10.5, 11.4, 12.4, 13.6, 15.2 and 17.1 seconds), and we cannot tell how much 17 s energy existed. There was enough to ensure it got picked twice between the hours of 2200 on February 14 and 0100 on the 15th. Firstly, waves of such periods are more dangerous when they break (see our previous discussion); secondly, longer-period waves are more likely to be focussed by refraction; and lastly, the "groupiness" of long-period components is well-known, which means there is a strong likelihood they will break on a regular basis, even if their mean energy is lower than that at which they can still accept energy from the wind without breaking. The recommendation is: if long-period energy is observed, it should be reported even if below the spectral peak.

Table 3.1.13 gives the characteristics of the 18 most extreme storms recorded in the Hibernia area, which Oceanweather Inc. used in its (1982) hindcast analysis (see our discussion above). The storm with the highest wave height and longest wave period was #8, of 21 January 1977. We can compare it with the Ocean Ranger storm, which was not included in the Oceanweather analysis.

Storm	Date	Pressure (mb)	Wave Height (m)	Spectral Period (s)	Direction (°T)	20-m Wind Speed (m/s)	Direction (°T)
8	1-21-77	942	12.09	16.14	55.40	30.55	237.67
Ocean Ranger	2-15-82	954 ¹	12.7 (11.4 11.2)	15.2 (17.1 ² 17.1 ²)	210 ³	32 ⁴	220 ⁴

Footnotes

1. Storm centre pressure: at the rigs the pressure got no lower than 972 mb.
2. Values observed at times (2230 Feb. 14), 0100 Feb. 15) when spectral peak was at 17 s.
3. From Zapata Uglund weather log. Not reliable.
4. 20-m wind speed and direction at peak of storm as observed by the Ocean Ranger (2000 Feb. 14, 1985).

Some questions arise from casual inspection of the numbers. Why did a higher centre pressure produce stronger winds? Was the most significant characteristic of the Ranger storm its higher significant wave height, or the longer period of the waves (at times when the waves were not so high)? Does the relative direction of wind and waves matter?

It is not the centre pressure which determines the wind field, but rather, the combination of two quantities: the distribution of pressure gradients within the storm, and its rate of progress. Both, of course, are the driving mechanisms for the winds which cause the waves which do the damage. The rate of progress of the storm has a subtle effect, not often referred to: the huge storm seas travel so fast that it is only by travelling with a fast-moving storm for thousands of km that they can "resonate" with the storm and reach a fully-developed state (that is, reach heights where they themselves become unstable and break). The energy contained in 17 s period waves, for example, travels at about 26 knots. Using simple assumptions (a non-evolving, northwards-propagating

circular storm with wind speeds 1 ms^{-1} faster than the phase speed of the waves has a sector in its southeast quadrant with favourable winds which propagates at the group velocity (half the phase velocity) of the wave field) it is not difficult to show (Snyder et al, 1981) that waves of 17 s period require 10^5 s , or 1250 km, to increase their energy by a factor of e (≈ 3).

Simply quoting central pressure and mean wind velocity does not specify the damaging effect of a given storm. One only has to look at the possible focussing effects at Hibernia for waves of period 16 s (see Fig. 3.1-3.1a), particularly for northeastwards moving waves, to realize the importance of following the storms up the coast, predicting the long-wave components as they come.

To make sensible estimates of the probability of fully-developed, 15 s period waves at Hibernia, and to evaluate the likelihood they will be focussed, a "Monte Carlo" approach is recommended. Hindcasts should be made on a group of simplified storms, travelling along the range of observed storm tracks so they approach the Grand Banks from a variety of directions and are refracted on their way to Hibernia, moving at a variety of speeds corresponding to a variety of wave group velocities from those for 15 to those for 20 s waves, say, and with winds in their SE sectors greater than the phase velocities of the waves by $1\text{-}2 \text{ ms}^{-1}$. The hindcasting should be kept as simple as possible to avoid a requirement for excessive computer time; it can be checked by tests against the Ocean Ranger storm.

3.1.3 Ice

--- p. 65-80:

The general information given about pack ice occurrence and properties appears accurate and up-to-date. Pack ice at Hibernia should be much less severe than in the Beaufort Sea, north-slope Alaska, and Lancaster Sound; and while pack ice must be considered, it will not affect the feasibility of development.

The presence of icebergs will be unique to the Hibernia area among producing fields. The descriptions of typical values and range of values of iceberg dimensions, mass, and quantity accurately reflect current knowledge. An intention to continue present levels of iceberg detection, monitoring, and management is stated in slightly vague terms. A need for improved detection and drift forecasting capabilities is correctly implied.

Pack ice and icebergs move in response primarily to random forcing by winds and ocean currents. This response in turn depends on characteristics of the pack ice or iceberg. For example the iceberg size or shape may affect its response to winds and currents while surface roughness, concentration, and ice strength affect the response of sea ice

to external forcing. All of these factors combined introduce a high level of randomness in the distribution and trajectories of sea ice and icebergs which we cannot hope to predict consistently. At best, probability forecasts can provide an estimate of the probability of occurrence of a particular outcome. Again the question which must be answered is what level of risk is acceptable.

Forecasts, both probability and the so-called categorical forecasts, are often only as good as the input data. Much more attention should be focused on routine monitoring of environmental conditions during production operations. In particular, remote observations (approximately 100 km radius of the production facilities) are required. It is strongly recommended that a network of automatic data buoys, both moored and free drifting in the ocean and on ice, be maintained within a 100 km radius of the production site. These buoys can provide invaluable information on surface atmospheric and oceanographic conditions including winds, currents, and ice drift speeds. A high level of quality control should be maintained over these data, preferably by an independent organization.

The probability of collision of an iceberg with a fixed structure is not explicitly stated, but can be estimated from the data given. An estimate of 1.3 probable collisions with a fixed structure during a 20-year period (see below) is probably conservative because (a) recently increased surveillance suggests that previous estimates of numbers of icebergs were on the low side, and (b) the estimate is based on each iceberg drifting uniformly through the region of interest, while observed iceberg tracks tend to be contorted and sweep more area than a straight track. On the other hand, some collisions would involve a glancing blow, or a small iceberg, or an iceberg travelling at below average speed and so might be less hazardous.

Estimate of probable number of iceberg collisions with a gravity-based structure:

Lifetime of structure: 20 years (estimated)

Width of structure: 100 m

Mean waterline length of icebergs: 105 m (page 75)

Centre-to-centre distance for collision: 100 m

Width of region through which icebergs travel: 500 km

Probability of collision for a single iceberg: $100 \text{ m} / (0.5 \times 10^3 \text{ m}) = 2 \times 10^{-4}$

Number of icebergs per year: 330

Probability of collision in 1 year: $330 \times 2 \times 10^{-4} = 0.066$

Probable collisions in 20 years: $0.066 \times 20 = 1.3$.

3.2 Biological Environment

In a very general sense, the EIS does an adequate job of providing "snap shots" of the various components of the marine ecosystem (exceptions to this generalization relate to treatment of planktonic organisms as discussed further under a separate heading). The superficial approach to

ecological processes and mechanisms is noted and generally is accepted given our scant knowledge, generally, of such matters. As noted above, the lack of accounting for natural variability in key components of the marine ecosystem (especially Valued Ecosystem Components) is a major shortcoming. The net results of these deficiencies in describing and understanding the biological components of the marine ecosystem of the study area is an inability to predict impact in anything but a generalized, superficial way. It can be argued that even with a more complete knowledge of the marine ecosystem, given that we have only a conceptual project disruption, the resulting impact predictions may be no more precise. Hence the dilemma to be faced in critiquing an exercise such as this.

3.2.1 Grand Banks - Flemish Cap Ecosystem

--- p. 101:

It states here that the pelagic larval stage of various organisms is most susceptible to adverse, naturally-occurring environmental conditions. In the absence of precise data regarding the effects of such natural conditions on the larvae, it would be difficult to point the finger at the oil-related development as a cause of an unusual fluctuation of a planktonic organism.

--- p. 102-103 (Fig. 3.2-1 and 3.2-2):

There is no mention of the cod and redfish which form a very important part of the ecosystem and a major part of the multiple use of the area along the slopes of the Grand Bank.

--- p. 104:

The report states that the small size of the mouth of flatfishes prevent them from eating all but the smallest fish. Actually, the plaice has a relatively large mouth and feeds mainly on fish especially capelin (Pitt (1973)).

--- p. 105 (Table 3.2-1):

The source of information provided in this Table is not indicated.

The prey information for lobster, shrimp and crab is inaccurate. Medusae, Ctenophores, Nematodes, insects and phytoplankton are not normally part of lobster and crab diet, nor are insects and phytoplankton part of shrimp diet as indicated. The major components of lobster diet, such as Hyas and Cancer crab, sea stars, sea urchins, bivalves and gastropods, are not indicated as such. Lobster (Homarus) is also indicated as being prey of silver hake but in this area their distributions do not overlap. Crab, particularly Chionoecetes, are prey to cod in this area but this is not indicated.

Generally known prey species of salmon are omitted. The missing items include Polychaetes, Cephalopods, Pandalus sp., and miscellaneous small invertebrates.

--- p. 109:

In addition to gadoids, plaice also migrate vertically in the water column. Plaice and turbot occurred regularly in catches from surface drift nets set for salmon on West Greenland Banks. Plaice also migrate vertically in the water column to take advantage of tidal stream transport to aid in migration to spawning areas (North Sea).

We always presumed that wolffish were benthic feeders and fed mainly on whelks, mussels, bar clams and other molluscs that can be crushed by their powerful molars. Lumpfish feed mainly on euphausiids, amphipods, comb jellies, and some other small fish. Fish such as lanternfish, scaled lancet fish, and other non-commercial fish are omitted from this section. These are especially important as food of salmon in this area and possibly for some of the cod in the slope area.

3.2.2 Marine Chemistry

--- p. 111 (3.2.2.1):

"Chemical studies of the Grand Bank region are few despite the importance of the area to the East Coast fishery". Unfortunately this statement is true and the authors of this portion of the EIS have only a few documents and publications on which to base their overview of the marine chemistry of the study area. What is more unfortunate is that the contents of this section do not adequately, or in many instances, correctly, represent the contents of the available published information.

--- p. 111 (3.2.2.2):

Dissolved Oxygen. This presents an unnecessary amount of data, which are difficult to assess. It would be much more appropriate to report oxygen concentrations as percent of saturation and then make some comment on supply and demand.

Suspended Particulate Matter. Are the values reported typical of a coastal or oceanic environment? (See MacKnight et al. 1981.)

Major Phytoplankton Micronutrients. There should be a cross-reference to Section 3.2.3.2 where the topic is actually discussed. Some reference should be made to the importance of upwelling to the supply of nutrients during the summer months along the edge of the Banks as well as to the magnitude of possible inputs from the nutrient-rich water of the Labrador current.

--- p. 112 (3.2.2.2):

Trace Metals. Unless the raw data of MacKnight et al. (1981) have been reworked, there are a number of minor errors in Table 3.2-3. The text does not convey the meaning of the data, which is that values are low and variable.

--- p. 113 (3.2.2.2):

Hydrocarbons. "These values are higher than other remote locations and may indicate that there has already been a detectable elevation of hydrocarbons on the Grand Banks above background levels recorded in other areas (Levy, 1983)". Levy (1983) is misinterpreted. The authors should read the entire paper and be familiar with supporting documents such as Levy and Walton (1976) and Hargrave and Phillips (1975). Levy and Walton (1976) stressed the variable nature of the distribution and concentration of tarballs in the Atlantic Ocean. The geometric mean from the Grand Banks study (MacKnight et al. 1981) is within the range extrapolated for this area by Levy and Walton (1976). Levy (1983) did not take sufficient samples to justify calculating a mean concentration.

"There are no data available on the polycyclic aromatic hydrocarbon content of the suspended particulate matter in the water column." However, MacKnight et al. (1981) attempted to measure concentrations in seawater from the Grand Banks but found that concentrations were below the limit of detection of their sampling and analytical techniques.

--- p. 113 (3.2.2.3):

Some reference should be made to the total organic carbon content and grainsize of the surface sediments, as these are relevant to the discussion of the hydrocarbon and trace metal content respectively.

--- p. 114 (3.2.2.3):

Hydrocarbons. This section is totally incorrect. Pristane, phytane, etc., were detected in samples analyzed by MacKnight et al. (1981). The reference to Keizer (1971) in Table 3.2-6 is irrelevant, since this paper was concerned with estimates of total hydrocarbons based on fluorescence not gas chromatographic analyses. No mention is made of the results from Levy (1983). Results from Levy (1983) should be reported after a careful reading of the full paper, rather than of the abstract and summary.

--- p. 114 (3.2.2.4):

Hydrocarbons. There are some observations in MacKnight et al. (1981) which are relevant. Certainly some comment can be made on what one would expect to find, based on published data from other studies.

3.2.3 Marine Plants and Microbiota

--- p. 116-121 (3.2.3.2) and p. 214-220 (3.2.9 - Energy Flow on the Grand Banks - Flemish Cap)):

We have no quarrel with the contracted studies (i.e. Grand Banks Oceanographic Studies, Volume 1 - Section 4; Volume 4 - Section 9). They seem to have done a competent job and to be aware of the limitations of coverage in space and time. Reservations that appear in the contractors' reports are absent from the EIS.

The EIS often betrays lack of scientific understanding. For example, Table 3.2-8 (p. 120) commits an error equivalent to measuring temperature each month and adding them to get a total temperature for the year (the alleged source, Hollibaugh and Booth (1981), does not commit this error). Comparisons of energy flow (p. 214 and Table 3.2-32) are immediately followed by statements that they are not really comparable - but nowhere does the EIS attempt to make the necessary comparisons. The quantified (though tentative) energy flow diagram following p. 9-42 of Hollibaugh's (1981) report is replaced on p. 217 of the EIS by a generalized, unquantified diagram, which is yet represented as depicting a great proportion of the flow in one pathway (p. 215).

--- p. 123-125 (3.2.3.3):

This section appears to be weak for its neglect of several important aspects concerning marine microbial communities.

1. Heterotrophic bacteria:

(a) An important ecological role of these organisms that is not discussed is that they serve as food for many microzooplankton (heterotrophic microflagellates). As such, bacteria form an important link in the transfer of material and energy from the small to large components of the food web. Bacteria cannot be viewed simply as agents for degradation and regeneration of nutrients.

(b) An assessment of the ecological role of heterotrophic bacteria cannot be made simply on the basis of their numbers in the water. There is no indication in this report of their rates of activity. It is likely that not all bacteria are equally active. Furthermore, total bacterial activity is likely to be strongly dependent on various physico-chemical factors, as well as the rate of supply of potentially limiting nutrients and the rate of grazing by microzooplankton.

2. Microzooplankton:

No mention is made of this important group of organisms. They constitute an important trophic link between the bacteria which they

consume and the larger zooplankton which consume them. They are also able to regenerate the nutrients required to sustain plant growth.

3. Cyanobacteria:

No mention is made of this important group of primary producers. It is likely that there are from 10^7 to 10^8 such cells per litre in these waters. Assuming (conservatively) that each cell contains 50 fg carbon, this leads to an estimate of 0.5 to 5.0 mg C/m³ for cyanobacteria in these waters - a significant proportion of the total phytoplankton carbon.

3.2.4 Zooplankton

--- p. 126-137:

Our review of the Zooplankton component of the EIS encompassed both the above captioned section of Volume IIIa and the two supporting study documents (i.e. Grand Banks Oceanographic Study Volume 2, Sections 5 and 6). The comments pertain first to the EIS per se and then chronologically to Sections 5 and 6 of the Grand Banks Oceanographic Study. Due to the supporting nature of the Study reports some of the comments are pertinent to the EIS volume as well.

a) EIS, Sections 3.2.1 and 3.2.4

Our general comment is that the sections on the zooplankton are inadequate as a review of the natural environment in which the Hibernia Development Project will take place. This is true of both the sections themselves and the supporting data base.

A criticism of the Zooplankton sections concerns the pervasive writing style that tends to obscure any valid attempt to accurately describe the natural environment. Whether intentional or not, the result is that the reader does not get an accurate, nor reliable, description of the study area based on existing information. This point is important as it is a criticism of the document, not the data base.

Among our objections to the report is the obtuse way in which "the study area" is dealt with. By definition, this covers the Grand Banks west to part of St. Pierre Bank and extends east to encompass Flemish Cap. Most references actually refer to the Grand Banks proper even though it is inferred to be the study area. On the other hand, Flemish Cap and the Grand Banks are occasionally discussed as if they were one. Clear examples of this exist on pages 100 and 127, and Figures 3.2-1 and 3.2-2, while purportedly covering the "Grand Banks-Flemish Cap Ecosystem" clearly only cover the Grand Banks. The fact is, oceanographically and biologically, these are two very different systems and this is clearly documented in the published literature. Failure to recognize this in the EIS is a major shortcoming.

A second criticism of the EIS is the omission of readily available published and written material. This is particularly true for the Flemish Cap and is a serious omission when specific studies by Mobil were never carried out there. As well, important documents for the Grand Bank have been overlooked. Among them is Davis (1982) which not only provides detailed seasonal data for an important inshore area but also contains a thorough review of all available literature for the Grand Banks area.

Something we find unacceptable in this EIS is the way in which statements are made and either not referenced or, more objectionally, are apparently mis-referenced. For example, within a sentence several points or facts may be made followed by a reference. Familiarity with the literature demonstrates that possibly only the last fact in the sentence is supported by the reference, or in other cases, the reference may apply to another area. Examples of this can be found on pages 100 and 127, but exist throughout. To the uninformed, reading such a 'cleverly' worded document, it appears as if much more is known about the natural environment in the study area than is actually the case. The truth is we still know very little about these ecosystems.

b) Data Base (Supporting Study Documents)

While the extensive sampling program carried out by Mobil in 1980-81 adds considerably to our knowledge of the Grand Banks, the study falls short of adequately describing the ecosystem. This is true of both the sampling design, but perhaps more importantly, of the analyses of samples and presentation of the results.

The sampling design was intended to cover a broad geographic area and collect a wide array of data, during a single year. This it did. It did not, however, focus sampling on potentially 'sensitive' areas such as the ocean fronts, spawning areas on the S. E. Shoal or Virgin Rocks or indeed concentrate on the Hibernia development area. All are important with respect to a relevant EIS. The result was a tremendous sampling effort that falls short of realistic objectives.

The processing and analyses of samples was done on a subset of those collected. Examination of samples processed shows there was no systematic selection that gives an adequate spatial coverage throughout the entire year. This results in poor month-to-month comparisons and presents some difficulty in defining the seasonal cycles. One example of this was the failure to define zoogeographic regions, even though these had been defined for the primary producers. The reason given is that the patchy nature of the zooplankton distribution obscures any differences that may exist. Examination of the data base demonstrates this is, in fact, a result of the small number of samples analyzed.

The presentation of results in the Grand Banks Oceanographic Study (and EIS sections) is a further digression from what might have been a much better study in its final form. For example, displacement volumes

are used as a measure of biomass when these knowingly are affected by phytoplankton during the spring (i.e. clogging). These data are then used to describe the seasonal cycle, whereas abundance data were ignored. This is a serious omission, especially when their estimate of the seasonal cycle matches that of phytoplankton but differs from all other published accounts (Semanova 1964; Kendaris 1980; Davis 1982; Colebrook 1982).

The copepod data presented in Table 5-3 in Section V of the Oceanographic Study report is another example. Here all copepodite stages have been lumped together. It is impossible to extract meaningful data on seasonal production cycles from this table.

A summary of specific criticisms of the supporting reports and EIS information is listed below.

- a) There is a total omission of any data on vertical distributions of the zooplankton. This includes both invertebrate and vertebrate plankton. Other than neuston sampling, these data were never collected. In addition, the treatment of vertical distributions in the EIS report ignores a major amount of published literature on the subject.
- b) The description of the seasonal production cycle is inadequate and probably wrong. We are not convinced, based on one data point, that Calanus finmarchicus is bivoltine. We believe the use of displacement volumes to show the zooplankton cycle actually shows the phytoplankton cycle due to net clogging.
- c) The estimates of secondary production are most certainly wrong. They used a series of assumptions in converting from displacement volume to kcal/m²/yr. Erroneous is conversion based on a protein-equivalent when lipid will be a very important component, especially during spring. They assumed three generations whereas they report C. finmarchicus, "the dominant copepod" as having only two or, to quote, "... a lesser increase during the autumn bloom may also occur" (p. 129, EIS). The values are meaningless.
- d) The prospect that overwintering of C. finmarchicus on the Grand Bank may not occur was recognized in the Oceanographic Study (p. 5-11) but this was never addressed in the EIS. Colebrook (1982) postulates that the Grand Banks may act as a 'seed' for spring production in the North Atlantic and Slope water currents whereas Semenova (1962, 1964) states C. finmarchicus does not overwinter on the Grand Bank but in the deeper, warm waters to the NE. This is a very important point from the standpoint of understanding the ecosystem and should have (could have) been resolved in this study. The fact that it was not stems directly from the inept way in which samples had been processed. Now that these samples have been destroyed there is no easy way readily at hand to resolve this question.

- e) There is absolutely no knowledge of yearly variation which most assuredly must occur.
- f) There is no demonstration of invertebrate zooplankton differences between areas which, we know, must exist. While differences were shown for fish larvae and eggs between some areas, they conclude ". . . the results did not indicate that ichthyoplankton are more abundant in one area than another" (p. 6-23, Oceanographic Studies). However, in the discussion they conclude ". . . this study, and others, demonstrate the existence of considerable natural variation of ichthyoplankton abundance through the season and between different locations" (p. 6-39). Surely it is clear that the existence of geographic differences has not been worked out at all. Therefore, we know nothing of 'sensitive' areas in the context of describing the natural environment of the study area.
- g) Regarding ichthyoplankton, there is no data on egg development times for the study area, while the estimates of larval growth rates are wrong. From the data presented in Section 6 of the Oceanographic Studies there is no overall summary of spawning and hatching curves. The data presented are often contradictory, confusing and incorrect. This includes differences between Ring Net and Bongo Net samples not resolved, discrepancies in Figures and Tables and abundance estimates which surely must be wrong. Given the statement in the EIS that ichthyoplankton are more sensitive to petroleum hydrocarbons than many invertebrates (p. 127), it is disturbing that these important parameters on development and growth rates have not been worked out as part of their description of the natural environment.

3.2.5 Benthos

The major supporting study (Hutcheson et al. 1981) is a very useful contribution to our knowledge of the benthos of the Grand Banks. Together with the archived records on individual species occurrences, abundances, and so on, it should provide an important reference for further work.

General observations on Section 3.2.5; Benthos are as follows:

This section fails to convey any sense of how little is known about offshore benthic invertebrates.

Both subsections (i.e. 3.2.5.2 and 3.2.5.3) on offshore benthic invertebrates present snippets of information on species occurrences, reproduction, feeding type, production, and so on, without acknowledging that there is no single species of non-commercial benthic invertebrate on the Grand Banks whose general biology and dynamics has been well studied.

It also fails to emphasize the very high variances in estimates of mean abundance of various animals at specific stations. These high

variances limit one's ability to compare statistically the work already undertaken and any future work.

There could be considerable annual variation in the dynamics of the various species, and this has not been addressed at all. One would like a series of observations at least as long as a few generation times for the major species being considered.

Direct calculation of production, at least for some of the major species, is preferred to the use of P/B ratios derived from studies elsewhere.

There should have been increased effort into designing sampling methodologies which would permit studies of the general biology and dynamics of those organisms not sampled quantitatively with bottom grabs.

--- p. 138:

The first sentence in paragraph 3 lists several factors affecting distribution of benthic fauna "within the study area". These factors may indeed be important but it should be noted that only one of the references cited refers specifically to the Grand Banks.

--- p. 139 (3.2.5.2):

The information on benthic assemblages (Fig. 3.2-13 and the unnumbered Table on p. 140) is confusing. It is derived from two different approaches. Nesis (1965) used a classical approach of identifying groupings based primarily on occurrence of large organisms, whereas Hutcheson et al. (1981) used statistical techniques to group all organisms including the smaller ones which are often numerically dominant. The technique used by Nesis defines assemblages which are mutually exclusive over large geographic areas, whereas that used by Hutcheson et al. might yield a patchwork of assemblages over small spatial scales, reflecting to a large extent small-scale patchiness in sediment characteristics. For example, Nesis described a Mesodesma - Cucumaria - Mytilus assemblage on the Southeast Shoal, whereas Hutcheson et al. identified three assemblages at a single station within Nesis' assemblage.

As noted by Hutcheson et al. (p. 7-52), there is a general lack of direct correspondence between the two schemes, yet the table on p. 140 attempts a synthesis. Fig. 3.2-13 comes directly from Nesis, and the accompanying Table has dominant species from Nesis (with some errors) and some additions from Hutcheson et al. It is difficult to deduce what criteria were used in deciding how species from Hutcheson et al. were to be added to each assemblage defined by Nesis. For example, Exogone hebes and Glycera capitata are listed under Group A (Southeast Shoal), yet Hutcheson et al. listed them as characteristic dominants in a mid-shelf community.

--- p. 142 (Figure 3.2-14):

Much of the information on spawning periods (Fig. 3.2-14) cannot be derived from Hutcheson et al. (1981), which is supposedly the source.

--- p. 143:

Estimated average benthic production was 536 kJ/m^2 , not kg/m^2 .

3.2.6 Fish and Fisheries

--- p. 150 (3.2.6.2):

Suggested changes to an earlier draft reviewed in August 1984 regarding redfish and cod on the eastern Grand Bank have not been incorporated into the text. It appears that many of our earlier review comments have not been incorporated into the final document. By way of example, the spelling errors in Table 3.2-17 are still there, e.g. Rheinhandtius for Reinhardtius.

The statement is made "that reliable estimates do not exist for species subject to large fluctuations (herring)". Presumably this means large fluctuations in recruitment. Yet in Table 3.1-18, which this statement refers to, published estimates are given and the reference is Wheeler and Winters (1984). Does this mean that the estimates from the reference are not reliable or are the statements simply contradictory?

--- p. 151 (Table 3.2-17):

For capelin, the stock areas are given as "2, 3L". For this species, the stocks are usually defined as SA2 + Div. 3K, Div. 3L, Div. 3NO and Div. 3Ps.

The stock area of Greenland halibut is really NAFO Subareas 0, 1, 2, and Divisions 3K and 3L.

--- p. 153 (Table 3.2-18):

The estimates of trawlable biomass (minimum) could easily be derived from research vessel surveys using STRAT Programs for skate and wolffish. Certainly there must be published estimates for biomass of Atlantic cod on Flemish Cap.

--- p. 154 (3.2.6.4):

The discussion on the distribution of major fish species is sparse and really says nothing. The use of the observer data and NAFO data for 1981-82 give a photograph of the distribution but fails to give an overall perspective of annual variations of migration, or changes in distribution, or of shifts in populations of species, or of interactions.

--- p. 155 (Table 3.2-20):

It would appear that this table is mislabelled. The catches appear to be 1981 catches rather than those for 1982. For instance 24,440 t for capelin would be the 1981 catch for Div. 3LN0. The total catch for Div. 3LN0 in 1982 is 27,436 t. One other catch we checked was American plaice - again the NAFO 1981 catch agrees with the figure given in this table, leading us to believe that the table is mislabelled.

Reference to Note (1) on the bottom of Table 3.2-20:

The source of this estimate is not given. Catches in Div. 3LN0 (from NAFO Statistics) peaked in 1975 at 165,880 t of which most was taken offshore. This catch is much smaller than that suggested here (i.e. that catches may have approached one million tonnes per year). Total catches in Div. 2J3KLNO were 364,000 t and 360,000 t in 1975 and 1976, respectively. These are peak catches and well below the total catch speculated on in the EIS.

--- p. 157-158 (Table 3.2-18 and 3.2-19):

The inherent variability in the fishery from year to year and the danger in assuming any year to be representative is evidenced by the following:

The distribution of the codfishery during winter (Fig. 3.3-18) does not reflect the situation of 1985 when there was an extensive foreign fishery for cod on the nose of the Bank in proximity to the Hibernia Development Area (Unit Area 327).

"In winter when most of the fleet are exploiting the cod fishery off northeast Newfoundland, the fishery for plaice is small" (p. 158). This is not true for the winter of 1985 since there was an intensive fishery for plaice on the Grand Bank this year.

The redfish fishery is distributed on the southwest edge and not on the southeast edge as stated in the text, unless Fig. 3.2-21 is wrong.

--- p. 166

The reference to "statistics on the number of mature fish entering rivers" is somewhat misleading in that all adult salmon entering rivers are sexually mature.

--- p. 167

Reference to salmon migration through the study area should read "May to August" and not "January to August".

Although there are salmon of mainland-origin in the study area, many are of Newfoundland origin.

The suggestion that "the importance of the study area waters to these fish is not known . . ." is not strictly true. We do know that stocks of salmon from many Gulf of St. Lawrence rivers (including rivers in Newfoundland, New Brunswick, Nova Scotia and Quebec), rivers in the study area, Atlantic coast of Nova Scotia, Maine, and Bay of Fundy migrate through the study area. The number of salmon migrating through the study area is 250,000 to 350,000 in an average year. Therefore we would conclude that the study area is very important.

As the EIS correctly states, Reddin (1984) found high numbers of salmon in the spring to the east of the study area. Given that appropriate oceanographic conditions (i.e. 4°C isotherm) exist more-or-less annually, salmon will probably be found near the Hibernia site in some years and just to the east of it in others. Whether these salmon overwinter in this general area or are simply passing through from known overwintering areas in the southern Labrador Sea is unknown.

--- p. 168:

Paragraphs 2 and 3 could be modified to more clearly indicate that on St. Pierre Bank sea scallops are found shallower than 55 m and Iceland scallops are found in heavy concentrations in deeper waters; and that on the Grand Banks significant concentration of Iceland scallops only have been located.

--- 170:

There is now a directed and very profitable long line fishery for halibut on the eastern edge of the Grand Bank (again reflecting the highly variable nature of the offshore fishery).

--- p. 173 (3.2.6.5):

There is no mention of lanternfish, scaled lancetfish, eelpouts, or any of the sculpins which are of biological importance to the ecosystem.

--- p. 174:

Other species of noncommercial or limited fisheries potential in the area would also include Atlantic saury (billfish), smelt, sea trout, and basking sharks.

--- p. 174 (3.2.6.7):

Cod are known to come to the surface of the water in pursuit of capelin during June-July in inshore areas and have been taken at the

surface in surface drift nets fished for salmon at West Greenland. Plaice and turbot are also known to do this and have been documented as being caught within 1-2 m below the surface.

Direct physical contact with the surface waters is the only way the authors suggest fish are negatively impacted by an oil spill. Mixing of an oil spill vertically throughout the water column was not mentioned, therefore any argument based on restriction of an oil spill to the top few centimeters of the water column is inappropriate. In fact, the Grand Bank is a well-mixed, high energy environment that is vertically mixed during most times of the year, save the months of July and August. Such mixing could result in at least sub-lethal concentrations of hydrocarbons within the water column.

Inshore habitat was not mentioned as a potentially impacted area. Such areas around coastal Newfoundland are important spawning areas for capelin (a beach spawner) and herring (it spawns subtidally) and important nursery zones for juvenile cod. Oil spill trajectory models shown in the text appear to be based only on wind forcing and the drilling site as the point source. Tanker spillage during transport was not considered and if oil from that source came inshore, there could be serious consequences.

--- p. 175:

The incidence of cannibalism amongst cod on the Flemish Cap has been a function of the availability of small cod and not, as implied here, a function of low availability of other prey, specifically redfish. One might indeed expect to see an increase in cannibalism with decreasing abundance of alternate prey if the abundance of juvenile cod was constant. However, during our observations on the Flemish Cap (1978-84) the intensity of feeding on both cod and redfish increased at the same time as both species produced relatively strong year-classes.

Although Plaice feed on sand lance in winter, the intensity of feeding is very low since the digestion rate is reduced because of low temperatures. There is more food in the stomachs during summer and fall.

--- p. 176:

Herring are filter feeders and are not so opportunistic as mackerel which feed heavily sometimes on fish larvae and other small fish and invertebrates.

It states here that "capelin are the most important food for salmon on the banks (Lear, 1981)". There is no such reference for Lear (1981). Capelin are a major prey for salmon in coastal inshore areas and on West Greenland banks but on the slope of the Grand Bank and over oceanic depths, salmon feed mainly on scaled lancet fish, lantern fish, Arctic squid, and amphipods.

Eggs and larvae of cod from 2J and 3K also may drift southwards over the Grand Bank into 3L.

--- p. 177-178 (Table 3.2-31):

No spawning areas or times are shown for St. Pierre Bank cod although this area is part of the study area. Also on the northern slopes of the Grand Bank no spawning locations or times are depicted. Again we would suspect that cod spawn along the north cape and northeastern slope of the Grand Bank.

Capelin spawning areas in the inshore are not shown although they were mentioned in the text.

--- p. 179 (Table 3.2-21):

The probable depth of spawning for cod in 2J3KL should be extended to 600 m. The temperature of spawning is probably closer to 3°C than 2°C.

The suggested temperatures for spawning in 3N0 (-1.0 to 4.5) and 3Ps (-0.4 to 6.0) may not reflect the temperature at which the cod actually spawn. A spawning temperature of -1.0°C is doubtful in view of the main spawning concentrations in 2J and 3K occurring in temperatures 2.5 to 3.5°C.

--- p. 180:

The reference to the lobster reproductive cycle is not completely accurate and is somewhat misleading. It implies that spawning occurs following mating in any given summer. This occurs in some animals that are spawning for the first time, however, in the vast majority of females spawning does not occur until about one year following mating (i.e. a 2-year cycle).

The reference to crab larvae remaining at the surface is inaccurate. Although they are generally highly concentrated at the surface they are found throughout the water column to depths in excess of 200 m in the case of snow crab.

Salmon migrate up rivers during June-August but spawn later during October and November. Smolts go to sea mainly during May-June in southeast Newfoundland according to data from North Harbour River in St. Mary's Bay.

--- p. 181-182 (3.2.6.8):

The assumption that "... large number of eggs produced by most fish but few of these survive to hatch ..." is incorrect. In fact, most pelagic fish eggs exhibit high survival rates and mortality is greatest during the larval stage.

The point being made in this section is not at all clear. If it is suggesting that natural variability in fish populations makes impact from anthropogenic sources (i.e. hydrocarbons) all but impossible, this isn't necessarily so. An analysis to separate hydrocarbon-induced variations from natural variations is possible. The data exist, and it would be a simple matter to develop measures of intrinsic variability, deduct known sources (e.g., see Leggett et al. 1984 CJFAS for capelin), and estimate the levels of hydrocarbon effect that would be necessary to detectably affect the residuals. This was not done, but we think it should be done.

--- p. 182 (Table 3.2-22):

For 2J3KL cod "Exploitable biomass" should read "Mid-year population biomass".

This section should read:

"Mid-year population biomass (age 4+) dropped from about 2×10^5 t in the early 1960's to 0.3×10^6 t in 1975 but is now approaching the 1.7×10^6 t level. Mid-year population biomass should increase to about 2×10^6 by 1990". The last sentence in the table is completely nonsensical regarding the fishery and catch rates for 2J3KL cod.

For the Southern Grand Banks Stock of cod "Exploitable Biomass" should read "Mid-year population biomass".

3.2.8 Marine Mammals

--- p. 204 (3.2.8.1):

The sighting record of whales throughout the years in the northwest Atlantic is biased toward the summer months. This is a consequence of winter weather conditions, sea state, and usually limited opportunities for vessel surveys. Aerial surveys would be limited as well. Therefore there may be small numbers of the large species throughout the winter (compare Table 3.2.29).

--- p. 205 (3.2.8.2):

The latest figures considered by the International Whaling Commission suggest that the humpback whale is probably approaching its pre-exploitation stock size in the Newfoundland/Labrador area. As there has been no commercial whaling for fin and sei whales for 13 years, these stocks are most likely increasing as well. The limiting factor here is the decreased frequency of shipboard surveys with experienced observers. This was not the case when whaling vessels were on the feeding grounds.

--- p. 206-213 (3.2.8-4):

The description of whale distribution based on the aerial and shipboard program is questionable because of (1) the short-term of the study and (2) the survey methodology used.

1. For marine mammals, seals usually follow the ice floes and whales often pursue their preferred prey species which is also regulated by the ice conditions (and water temperature). The distribution of marine mammals, therefore, would vary from year to year due to different ice conditions as shown by the large variation in the ice cover in Figure 3.1-33 (page 68-69). Only a long-term study can provide an adequate description of marine mammal distributions. The distribution described in the Hibernia Environmental Impact Statement, however, was gathered from the aerial and shipboard survey program conducted on the Grand Banks during March 1980-March 1981. For example, the ice cover of early 1981 was similar to the extreme minimum limit in Figure 3.1-33 of February and April. The survey conducted in 1981 would therefore result in a whale distribution biased toward a warm water condition.
2. A discrepancy between aerial survey routes and ship survey routes was found between Figures 3.2-39 and 3.2-40 (page 208-209) in Volume IIIa and Figure 1 and 2 (page 2-3, 2-4) in MacLaren Plansearch's Grand Banks Wildlife Study. The value of routes chosen in aerial and shipboard surveys are debatable. Non-overlapping transect lines would weigh each unit area equally and would have provided a better statistical basis.

--- p. 210 (3.2.8.4):

Fin whales have a demonstrated ability to move very close to shore (if prey are sufficiently attractive) and are not necessarily restricted to the offshore by virtue of their size.

Sei whales display unusual and, so far, unpredictable migratory behaviour; thus their presence or absence over relatively short periods of observation (several years) may have little meaning.

This has been so often the case that whalers often refer to "sei whale years" when they suddenly appear in abundance.

3.2.9 Energy Flow on the Grand Banks - Flemish Cap

The analysis is based on selected groups of organisms rather than overall productivity measures. While it is certainly true that our knowledge of the ecosystem is limited and little information is available on some important components, it is difficult to see how any meaningful statements can be made about the potential impacts of oil spills on the economically and socially important higher trophic levels (commercial fish

stocks, marine mammals and birds) without an estimation of the energy budget for the entire ecosystem.

Some of the potentially important groups of organisms receive little or no consideration in the analysis. In this section and the earlier one on benthos the emphasis is on macrobenthic organisms with virtually no examination of the meiobenthic fauna. In fact, the energy-flow diagram (Fig. 3.2-41) shows the micro/meio-benthic detritivores solely as exporters and not consumers (presumably there is an arrow missing from the detritus pool). In the benthic section it is suggested that the chief function of the meiobenthos is remineralization rather than energy flow, but there are few data to support this. Given the potentially greater susceptibility of benthic communities to oil spills and the importance of benthic production to the maintenance of commercially important demersal fish stocks, the assessment of risks to the benthic environment seems somewhat weak. The gelatinous zooplankton are another potentially important group which receives minimal attention in the energy-flow analysis. In some systems they appear to play an important role in stabilizing spring blooms, and they are known to be important predators on fish eggs and larvae. Their importance is amplified by the fact that some appear to have unusually high metabolic rates. Little is known about the sensitivity of these organisms, but it seems desirable to try to assess the possible effects that might arise if they were affected by an oil spill.

The importance of detritus and bacterial degradation in the energy budget of the Grand Banks is referred to, but we were unable to find reference to ways in which this might be affected by an oil spill. It seems possible that low concentrations of oil could affect the dynamics of particle formation and transport in a way which could significantly affect nutrient recycling and benthic-pelagic coupling. It is also suggested that the DOC pool could serve to stabilize the system against fluctuations in primary production, so understanding of the dynamics of the detritus pool seems important in predicting the potential impacts of oil spills.

Hibernia is located close to the shelf break, where a frontal system (Fig. 3.1-28) appears to be associated with a region of very high productivity at all trophic levels (Fig. 3.2-1/2). Even fairly localized damage in this area could have more serious consequences for the overall productivity of the system than more widespread damage in less productive areas. This concentration effect should be taken into account, especially since the oil spill trajectory studies indicate that this area is likely to be impacted by a spill at the Hibernia site.

VOLUME IIIb - BIOPHYSICAL ASSESSMENT

4.0 IMPACT ASSESSMENT

In its description of the existing biophysical environment the EIS, (Volume IIIa) goes to considerable lengths to examine not only the individual components of the marine ecosystem but also attempts to describe ecological linkages, critical processes and mechanisms, and community structure. We are led to believe that understanding these ecological underpinnings is critical to impact prediction. By way of example, some of the "ecological approaches" taken in Volume IIIa include descriptions of feeding relationships of commercially and ecologically important finfish, shellfish, and marine mammals; benthic community structure; and energy flow on the Grand Banks - Flemish Cap. Although the EIS goes to considerable lengths in its attempts to describe the marine ecosystem as a project setting, in its impact predictions it is difficult to see how the EIS uses this information.

Although the EIS purports to examine impact at the ecosystem level ("ecosystem" is included as an environmental component in the various impact matrices), it appears that the approach taken towards assessing impact based on ecosystems is somewhat ill-defined. Although a more detailed description of the biological impact assessment methodology is presented in the background supporting study undertaken by Hardy Associates (1978) Ltd., it sheds little light on the manner in which ecosystem impacts are determined.

In the absence of a detailed assessment methodology, the reader must assume that the impact of project components on ecosystems is rated in a manner directly and linearly related to the impact rating assigned to component species or populations. If this is indeed the case, then the approach is unacceptable. One cannot deduce ecosystem impacts from individual species or population impacts translated into reduction in numbers of individuals. It is generally accepted that size is not the only attribute of a population that has implications for the larger ecological unit. Population structure and function are also important attributes. In addition, ecological relationships among ecosystem components are characteristically non-linear and multiplicative rather than additive.

It is generally accepted that when component populations of an ecosystem are perturbed, changes take place in many parts of that ecosystem. Given our present state of knowledge (i.e. uncertainty), we are often unable to predict what these changes will be and their significance. In recognition of this constraint on our ability to predict impact in a fully holistic way, the EIS should make allowance for this degree of uncertainty.

One realizes the difficulty in preparing an impact statement for public information without obscuring important points with technical detail. Yet, the complexity of the topic often prescribes that opinion and hypothesis be detailed to a sufficient degree in order to provide a high level of confidence in the substance of the exercise or more specifically, to distinguish between statements or predictions made on the basis of firm scientific evidence, professional judgment or guesswork. Experts are aware of the nature of such judgments and care must be taken to communicate the same balanced message to the public. Much of the judgment in the Document should be generally acceptable but is often insufficiently detailed to present as fact, and sometimes the facts do not justify the seemingly strong conclusions. For instance, discussions on the impact of a major sub-surface blowout is really guesswork, but may be read by the non-specialist as fact.

Also, the caveats surrounding usage of the terms "no effect", "negligible effect," etc. are not introduced often enough. Most professional opinion likely agrees that, in the absence of a major spill event (i.e. blowout or storage spill), the probability for population impact is low. Yet, in the context of the Grand Banks, where populations generally extend over very large geographical areas, it cannot be overstated that any impacts will likely be far-reaching before being translated into population level impacts - especially in relation to the definitions used in the EIS for major, minor or negligible effects. Knowledge for assessing the complexity of environmental effects will always be incomplete, thus even impacts which are (presently) indicated to be quite minor or even negligible at the population level should still be cause for close evaluation and scrutiny. In this regard it is noted that effects which may "impact" small segments of populations have not been discussed in sufficient detail, or if introduced, have been down-played, or subjected to oversight, to an unacceptable degree. The non-specialist may be left with the opinion that lack of evidence for population level effects translates into complete lack of effects. Indeed individual level effects can certainly be anticipated under low-level chronic exposure conditions - say 1-5 kilometers from rig sites, and this includes water column as well as sediment dwelling organisms.

Probably the nuance of the topic of sublethal effects and ecotoxicological-demographic causal relationships should be spelled out a little more clearly in such documents. For instance, the messages found in the phrases below are quite different: (a) ". . . thus the impacts on the population can be expected to be negligible . . ." (b) ". . . thus the impacts on the population can be expected to be negligible but hydrocarbon related pathologies and tainting may be associated with any fish catches taken within 5-10 km of production rigs . . ." Phrase (b) presents a more balanced judgment.

The EIS should also refer, in at least a general way, to the synergistic or cumulative effects of several protracted projects similar to Hibernia. Given the possibility of additional development of oil

fields on the Grand Banks, and the expectation that impact prediction would continue to be conducted on a case-by-case basis, there is concern that cumulative impact will not be considered. The lack of area-wide impact assessment to examine cumulative impact of a number of developments over time is a major deficiency, generally, of our efforts to predict impact for offshore oil and gas development.

4.1 Impact Assessment Methodology

4.1.2 Impact Assessment Method

--- p. 5 (4.1.2):

In addition to the concern outlined above to the effect that the impact assessment is not truly ecologically based, the following concern is highlighted with respect to the definitions of ranks (or levels) of impacts, and hence the connotations of significance, that are conferred on individually appraised impacts. Here, as previously, note has been taken of the supporting document entitled, "The Method for Environmental Impact Assessment: Hibernia Project". This concern is illustrated by the following discussion.

By the definition of a "major" impact a whole population or species must be affected for several generations. It could effectively be concluded that, except in the case of extremely rare and narrowly distributed populations or species, no major impact from virtually any anthropogenic activity is therefore feasible. As a result, any significant impacts which the Hibernia development has a potential to cause are relegated to the rankings of "moderate" or "minor". In the same vein, at the other end of the scale, the methodology refers to small, local impacts as "negligible". One might logically conclude that if an impact is labelled "negligible" nothing need to be done to avoid it, which is not so. Moreover, one is again led to question how many of these "negligible" impacts it takes to add up to a "minor" impact. On the other side of the coin all beneficial effects, no matter how "negligible" are given the imprecise term "positive" impact. Members of the public might quite logically conclude that some of the "positive" benefits discussed are of major significance, which in fact is not so.

The underlying problem with the assessment methodology chosen is focused on the population level of analysis. By focusing on the population level, a number of basic assumptions are made that then determine the resulting "nil or negligible impact". The most critical of these assumptions concerns the concept of natural variability and the inherent problems associated with detection of impacts as distinct from background natural fluctuations. While relying heavily on the concept to arrive at largely insignificant impacts at the population level, it is interesting to note that there are virtually no estimates of natural variability offered for any of the populations identified as key environmental components.

Another criticism of the chosen impact methodology is that there is no suggestion that any of the impact predictions have any uncertainty associated with them. This deficiency is a logical consequence of not addressing uncertainty in the foregoing descriptions of environmental components and the composite ecosystem (Volume IIIa). A further contributor to this "state of complete certainty" is the lack of rigor in setting boundaries. Only in the case of the Zone of Influence of Discharges is there any attempt to set boundaries and in this case the process used is unclear. Focusing on impact at the population level and largely using the acute toxicity literature to the exclusion of the significant literature on ecotoxicology, largely ignores cause-effect relationships resulting from multiple sub-lethal effects, thereby reducing uncertainty. The literature suggests that these effects may operate in a multiplicative rather than additive way, resulting in acute impacts not detected when focusing on single toxicants. Hence the confidence (and probable error) shown in predicting additive and repetitive impacts.

The impact assessment methodology purports to have used the recently developed concept of "Valued Ecosystem Components" to arrive at critical and sensitive environmental components for the impact matrices. A quick glance at any of these matrices will show that, in fact, VECs were not identified but rather it is the classical "shotgun" approach to impact prediction that results. The originators (Beanlands and Duinker) of the concept clearly point out that VECs are chosen through a rigorous process of scoping involving the proponent, government, academia, and the public. No such formal exercise was conducted as part of the Hibernia EIS.

In view of the above criticisms of the chosen methodology for EIA, what are the alternatives? One obvious alternate approach is to recognize the degree of ecological uncertainty you are dealing with, set rigorous boundaries and scales, focus on measurable things (preferably Valued Ecosystem Components), develop testable hypotheses for monitoring, and ensure that EIA is an ongoing process that doesn't stop short at the completion of the review of the EIS. In short, follow the philosophy outlined in the Beanlands and Duinker paper.

An alternative involves use of the increasingly-popular concept of ecological risk analysis. Risk assessment, as distinct from impact assessment, recognizes the inability to make impact predictions in a deterministic way with absolute certainty. Classical EIA ignores the importance and pervasive nature of ecological uncertainty. Ecological risk assessment depends, in the first instance, on the availability of a good engineering risk assessment (a deficiency in this particular EIS noted in our review of Volume II). Ecological risks are then determined given the probabilities of various events (i.e. spills, upsets, routine discharges, etc.) as they are translated into ecological consequences. In the process, uncertainty is quantified and evaluated in a rigorous, objective way. Ecological risk assessment could get us away from the types of statements of complete certainty seen in the Hibernia EIS which

reflect an assumption that the ecosystem we are dealing with is completely understood and therefore there is no concern for uncertainty.

4.1.3 Boundaries

--- p. 6 (4.1.3.1):

It is difficult to see, however, how the proponent came up with the boundaries for the Zone of Influence of Discharges from Routine Operations. Was the 2 km wide band around the perimeter of the two reservoirs determined as a consequence of some modelling of effluent dispersal? If so, the methods and results should be discussed.

--- p. 8 (4.1.3.1):

The EIS does not deal with tanker spills outside the immediate Hibernia area because "Hibernia shuttle tankers will enter the regular shipping lanes very soon after leaving the Hibernia facilities". The federally-produced EIS guidelines require a consideration of "transportation strategies and technologies . . . in sufficient detail to allow the reviewer to comparatively evaluate the . . . environmental risks of the alternatives". Clearly, the EIS should consider the increased risk of oil spill in these existing shipping lanes and examine the selection of shipping routes which would minimize risk to biota if an accident were to occur.

4.2 Construction and Development Drilling

4.2.1 Physical Facilities

--- p. 12 (Table 4.2-2):

It is proposed that during abandonment flowlines and the export line be "flushed out; filled with sea water; capped". In the first instance these should be removed from the sea floor and if they are to be abandoned why go through the trouble of filling them with water and then capping same?

--- p. 15 (Table 4.2-3):

No abandonment procedure is given for remote wells. Surely these wells, like their counterparts associated with the Floating Production System, would be plugged, capped, and cut off at the seabed.

4.2.3 Liquid-Solid Releases

While Tables 4.2-5 and 4.2-6 give some information on the nature and expected concentration of various liquid-solid releases, there is no information on the overall loading (by weight) of hydrocarbons and heavy metals to the marine environment over the life of the Construction and

Development Phase. It would therefore be useful and enlightening to see estimates of the total weight of hydrocarbons and selected heavy metals discharged annually during this phase.

--- p. 21 (Table 4.2-5):

There is no indication of the use of oil-based drilling muds for directional drilling from the Floating Production System. However, in Table 4.4-1, Volume II we are told that OB muds will be used and cuttings discharged; a clarification is required.

--- p. 22 (Table 4.2-6):

This table suggests that cuttings will have 5-15% oil while Table 4.4-2 in Volume II suggests 10-20% oil adhered to cuttings - which is more accurate? It is not clear whether these values are pre-washing or representative of levels encountered following washing.

--- p. 25 (4.2.3.1):

The proponent categorically states that only water-based muds will be used in a floating system contrary to information contained in Table 4.4-1, Volume II. If oil based muds are to be used the impact of discharging oily cuttings should be assessed.

--- p. 26-27 (4.2.3.1):

For the initial dilution (water based muds) of 300-500X there is not enough information in the ASA report to tell if this seems reasonable.

The dispersion diagram of p. 27 seems reasonable. However, the statement at the bottom of p. 26 is somewhat misleading - i.e. dilutions of 100,000 - 10^6 will occur. The average conc. from Fig. 4.3.4 represents a dilution of approximately 40,000 after 10 hours.

-- p. 28 (4.2.3.2 and 4.2.3.3):

Information on OBM cuttings is based largely on North Sea experience, but there exist more recent data from Dobrocky Seatech dealing with the Scotian Shelf, which may be more relevant. If the North Sea is a less "dynamic" environment than Hibernia, we would expect discharges to be less widely distributed there than in Hibernia. How relevant is the experience with discharges from the Alma (Scotian Shelf) well to Hibernia?

In order to facilitate impact determination, the proponent should provide information on the total areal extent of drill cuttings (water and oil based) and dumps of water based mud. Given that the number of locations will be greater for the Floating Production System, there may be a significantly greater total area involved as well.

4.2.6 Additive and Repetitive-Chronic Impacts

--- p. 36

The significance of repetitive and additive impacts are dismissed in a rather cavalier fashion. In practice, such impacts from construction and drilling may indeed not be significant in the long term given the rather short duration of this phase of the development. There is, however, insufficient evidence and knowledge of the phenomena to dismiss them so lightly. This whole area should be highlighted as a deficiency or information gap for the purposes of impact prediction. This is especially true for the operational phase of the project.

4.3 Operation and Maintenance

4.3.3 Liquid-Solid Releases

Tables 4.3-3 and 4.3-4 provide information on the nature and concentration of expected effluents during the Operation and Maintenance Phase. As suggested previously, we should be provided with data on total annual releases of hydrocarbons, selected heavy metals, and other potential toxicants over this phase of the development.

Discussion of dispersion rates for cooling water and produced water is largely based on model predictions of ASA (1984), without a clear description of the ASA model or demonstration of its relevance.

The ASA model predictions seem plausible on the whole, but model description is inadequate (even in ASA (1984)) and a number of arbitrary assumptions are made, pertaining to the following:

- assumed vertical thicknesses of plumes
- specified currents
- entrainment and dilution during rising/sinking of plume to surface/bottom/pycnocline
- relevance of Okubo's (1962) spreading rate (ASA (1984), p. 23) to the Hibernia area.

Considering the above, we lack confidence in the adequacy of the dispersion estimates in the EIS.

--- p. 41

To our knowledge, water chlorination has not been raised as a possible environmental concern in the offshore. However, it is of interest to note that 30-100 thousand cubic metres per day of chlorinated water may be used. This is a considerable volume and in relation to toxicity may be much more important than hydrocarbons from production waters, storage cells, or drilling fluids. Residual chlorine is highly toxic - actually orders of magnitude greater than petroleum. The formation of relatively high concentrations of bromoform and other mutagenic haloforms (special to seawater as distinct from fresh water) and the possibility for resource contamination warrant some attention. Also, it is known that chlorine reacts readily with PAH forming chlorinated hydrocarbons and the relatively high concentrations of PAH associated with oil-rig waters may present a special environment for the formation of chlorinated hydrocarbons. If any of these compounds are formed and found to bioaccumulate in fish, they may present contaminant/fish quality concerns.

--- p. 42 (Table 4.3-3):

Concentration of oil in produced water is given as 15-35 ppm while in Table 4.4.1, Volume II it is given precisely as 40 ppm; why the discrepancy?

--- p. 44 (Table 4.3-4):

Concentration of oil in produced water is given as 15-40 ppm while in Table 4.4.2, Volume II it is given precisely as 40 ppm; again, why the apparent discrepancy?

In comparing tables 4.3-4 and 4.3-3 it would appear that lower levels of oil in produced water will result from the Floating Production System - is this the case; and if so, why?

In both tables the "government standard" for oil in produced waters is given as 35 ppm. Is this "etched in stone"?

--- p. 47 (4.3.3.1):

The worst-case estimate of 0.11 km² of the Grand Bank sea floor covered by water with 3.5 ppb of hydrocarbons is based on a modelled discharge of only 3,200 m³/d (ASA, 1984). This is suggested as being representative of anticipated Phase I discharge for the Floating Production System. Yet in Table 4.3-3 we are told that the Phase I discharge of produced water will be 7.2×10^3 m³/d (an intermediate figure of 5,000 m³/d is given in Table 4.4-1, Volume II!)

To make direct comparison with the area to be affected under the Fixed Production System, we should have information on the expected area

to be contaminated during both Phase I and Phase II. The discharge rates used in the modelling should be consistent with those given elsewhere in the EIS. Clearly, using these discharge rates, the area affected in Phase I alone will be greater than 0.11 km².

--- p. 48 (4.3.3.1):

Modelling by ASA indicates that discharges of produced water above the thermocline will result in dispersal of same above the thermocline. Given that discharges will be greater than the 3200 m³/d used as input to the model, the areal extent of water having concentrations of hydrocarbons at 5-10 ppb will be substantially greater. Given the likelihood of lethal and sublethal effects to pelagic organisms (i.e. larval fish and crustaceans), it would be preferable to discharge produced water below the thermocline.

--- p. 48 (Table 4.3.7):

In presenting various hydrocarbon concentrations in this table the proponent has neglected to indicate what the concentrations actually represent (i.e. total hydrocarbons, water soluble fractions, total aromatics, etc.). Without these qualifiers the concentrations are meaningless.

The referred threshold concentration for acute lethality (24-96 hrs.) for marine fish seems to be in error. Shouldn't it be 1 ppm rather than 1 ppb (1 ug/L)?

Apart from Table 4.3.7 and its associated text, the possibility of tainting is hardly mentioned, nor is it dealt with in any detail under "Monitoring". But the tainting threshold is stated to be 0.1 ppm hydrocarbons (what specific fractions and for how long?) and given the relatively large amounts of hydrocarbons which will be discharged at various stages of the operation, we think it reasonable to ask for a more thorough discussion of potential tainting problems.

There is very superficial treatment of chronic, sublethal effects. We know long-term exposure to very low levels of certain hydrocarbons can produce biochemical changes in fish, such as induction of hepatic and/or renal mixed function oxidase (MFO) systems. Now, the adaptive significance of MFO induction is not yet clear - it may protect the animal, or it may interfere with normal steroid hormone metabolism, and hence reproductive success. At the very least, MFO induction represents some diversion of energy from "normal" metabolic processes, and surely should be mentioned as a possible impact, especially as it has been the subject of intensive study during the last decade. The subject is not mentioned here, nor in the section on Monitoring.

--- p. 50 (4.3.3.1):

For the Fixed Production System, modelling by consultants of behaviour of produced water assumes a deep water (i.e. 45 m) discharge. Even though a deep water discharge would seem to minimize risk to pelagic organisms and be more acceptable, it would be interesting to model a discharge above the summer thermocline to make direct comparisons with the Floating Production System discharge into the same area of the water column.

--- p. 52-53 (4.3.3.3):

We are told categorically that there will be no oily storage displacement water discharged in a floating production system and that in a fixed production system it will be discharged, and untreated at that. There is no explanation of the difference in operating procedures. Why is there storage displacement water in the fixed mode and not in the floating mode?

We are told that the hydrocarbon content of the storage water should be very low because of its long retention time in the storage cells. Yet in Table 4.3-4 we are told that hydrocarbon concentration will be 10-35 ppm - not an insignificant amount!

In modelling behaviour and fate of the plume of released displacement water, the ASA report suggests that at a release depth of 45 m during summer the plume will achieve neutral buoyancy above the thermocline because of its slightly elevated temperature. However, we are told that produced water at 65°C, released at the same depth, will not demonstrate the same behaviour and remain below the thermocline; an explanation is needed.

While we do perhaps concede that the impact upon marine biota from oily displacement water would be negligible at the species or population level, the cumulative impact of discharging displacement water and produced water (particularly if released above the summer thermocline) could be significant for pelagic organisms.

This claim is substantiated by the suggestion on page 124 that storage displacement water "may have more than negligible impact".

4.3.6 Additive and Repetitive-Chronic Impacts

--- p. 55

Leading from comments directly above, we do not concur with the proponent that additive chronic impacts will be negligible. For both benthic and pelagic organisms the impact could be significant. The particular significance to each of the groups of biota will be determined largely by whether hydrocarbon-contaminated discharges are made near the

surface or below the summer thermocline. On balance, it would appear that deep water discharges would be preferable overall, even though this would clearly be at the expense of the benthic community. It is interesting to note that although the proponent considers additive and repetitive impacts upon benthic and pelagic organisms to be negligible, this is not reflected in the impact matrix on page 37, which shows such impacts to be "minor".

4.4 Comparison of Environmental Impacts

--- p 57-59 (Table 4.4-1):

No reference is made to water-based muds and associated cuttings which will be a feature of both production systems. With multiple discharge points, the Floating System should result in a larger areal extent of coverage and impact.

On the basis of information (largely conceptual) available, there does not appear to be any significant, overall impact differential between the Fixed and Floating Production Systems. Each system offers some specific environmental advantage over the other (i.e. impact upon fishing activity, risk of oil spills, chronic effluents, etc.) but on balance there does not appear to be any preferred mode from an environmental perspective. This should and could be clarified through engineering risk assessment. In the absence of same, it is unfortunately a matter of minimizing potential impact at the design stage for whichever mode of production the proponent ultimately proceeds with. This does not allow any realistic input to the selection of the development mode on environmental protection grounds.

4.5 Transportation Facilities

4.5.1 Supply and Work Vessels

--- p. 63 (Table 4.5-2):

Information in this table, which reports from 600 to 800 L/day oil spilled from bilge pumping by current (pre-HIBERNIA) shipping, is puzzling. Apparently this number is a theoretical number. But what is its source? Presumably it was derived from some estimate of current vessels multiplied by some bilge factor. But using the 4-5 L/day number expected with 4-5 shuttle tankers, this would imply that there are currently between 600 and 800 vessels over the HIBERNIA area each day. That does not seem correct. Is it that the proponents erred on the high side with the current figure, and on the low side with their shuttle-tanker spillage estimate?

4.6 Abandonment

4.6.3 Potential Impact

--- p. 65-67 (4.6.3):

While we generally concur with the proponent's conclusion that impacts to biota and the overall ecosystem will be negligible or non-existent, impacts to fishing activity will be significant unless all structures and components are removed and the seabed returned to a "trawlable" condition.

4.7. Major Accidents: Offshore Production Facilities

4.7.1 Oil Spills

The discussion on the fate and effects of a major oil-spill is too simplified and the amount of guesswork in the assumptions (predicted natural dispersion rates, survival time of Hibernia crude, evaporation rates of Hibernia crude, etc.) is not adequately documented - even in a general manner.

--- p. 68-69 (4.7.1.1 and 4.7.1.2):

Most of the background information is reviewed in the comprehensive report by S. L. Ross (1984). We have no major disagreements with these results. One point worth re-examining, however, in view of the harshness of Hibernia winter conditions, is the estimate of the 90 days required to drill a relief well in the event of a blowout. This period essentially defined the total amount of oil released in such a disaster.

We accept that the majority of blowouts involve small amounts of oil, and usually it is only the larger, more serious ones that are individually significant (cf. automobile accidents and the damage/costs incurred). Any conclusions based on a consideration of "an average size blowout spill" (like the average car accident) are highly suspect and may be totally irrelevant.

The choice of a worst-case batch storage spill is 30,000 m³/d. This represents either the rupture of a single compartment of the floating storage vessel or rupture of a single storage cell of the GBS. One must accept that the selection of these scenarios is normally based on statistical evidence. It can be argued on the basis of no statistics being available generally for large batch storage spills (and given that iceberg-infested waters represent a new production frontier) that the worst-case scenario is understated. Arguments can therefore be made that the loss of full storage capacity should be considered a worst case. Similar arguments can be made with respect to spills for shuttle tankers operating in such an environment.

--- p. 69-73 (4.7.1.4):

While considerable attention is given in this section to the prediction of plume form and behaviour together with slick form and linear dimensions, a critical parameter is missing. In order to predict impact, full areal extent of the slick is prerequisite. From data presented, determination of this parameter cannot be made.

Another critical parameter missing is concentration of oil in the water column beneath the surface slick. While we are presented with estimated concentrations near the scene of the spill, we have no indication of expected concentrations over the full areal extent of the slick.

--- p. 73-80 (4.7.1.5):

The calculations of slick survival time and trajectories tend to ignore the effects of the emulsion process which is capable of forming nearly neutrally buoyant mats of oil that may reside below the surface. These may survive considerably longer than the surface slicks and their formation is virtually unpredictable.

In the KURDISTAN incident, the spilled oil (Bunker C) disappeared in ice-cold seas for several weeks, only to reappear in the form of drops, pancakes, and large patches on the shores of Cape Breton Island. In that instance it was not moved southward by the Scotian current, as would have been expected from slick modelling exercises. Instead, subsequent studies showed that short-term (one to four-day) wind events dominated the movement of the KURDISTAN oil, and it was the wind regime at the time that was the underlying cause for the direction that the oil took.

--- p. 73 (4.7.1.5):

The assimilation capacity of the sea for hydrocarbon degradation and the ability of bacteria to use oil as food is presented in too simple a manner. The alkane fractions of oil are fairly rapidly degraded while polycyclic aromatic hydrocarbon and asphaltene fractions are quite resistant to bacterial degradation. Even here, however, it is important to note that reference should be made to "dissolved" hydrocarbons and that tar balls, specks, or pancakes will require months or years for dissolution and degradation.

--- p. 75-76 (4.7.1.5):

For a worst-case surface blowout in summer, it is expected that a recognizable slick will survive for 40 days. Figure 4.7-5 indicates that a slick containing circa 10% of the original oil after 18 days would have moved 400 km. In the NORDCO Fisheries study (1984) it is suggested that spreading of spilled oil over most of the Grand Banks would result if the spill lasted for a month (p. 85) and this phenomenon is again referenced

in the Seaconsult (1984) study. In view of these predictions, it is critical that information on full areal extent of surface slicks from worst-case blowout and storage spills be generated and that accompanying data on water column concentrations of hydrocarbons be considered.

--- p. 80-82 (4.7.1.6):

In general, we find it difficult to visualize how the proponent could make impact predictions in the absence of information on the full areal extent of the oil spills and the resulting hydrocarbon concentrations in the water column.

The results of trajectory modelling suggest for a worst-case surface blowout in either summer or winter that the Southeast Shoal and Shelf-break area on the Nose and Tail of the Grand Bank would be key targets of spilled oil. These two areas represent major fishing areas and critical areas for biological production.

The proponent suggests that levels of hydrocarbons in the water column (5-130 ppb) following the Ekofisk surface blowout were "well below threshold levels for sublethal effects on water column organisms". Recent literature on the subject and work by DFO scientists, has established 50-100 ppb to be the usual range for sublethal responses. The proponent further quotes a reference to 2 ppm being a threshold for sublethal effects. This is clearly in error.

An assessment of the likely concentrations of oil beneath a surface slick undertaken by DFO (Longhurst, DFO Tech. Rept. No. 1096, 1982) suggests 10-300 ppb in the upper 10 m of the water column and 10-25 ppb for deeper waters. The effect of the summer thermocline over the Grand Banks would be to concentrate most of the oil in the first 50 meters. In this situation sublethal responses would be expected in fish larvae and at 300 ppb induction of direct mortality could begin.

On the basis of the above, we are of the considered opinion that prediction of impact on larval fish given in Table 4.7-4 is underestimated. With significant areal extent of oil and high ppb (i.e. low ppm concentrations) acute toxicity is possible. Because of the rather restricted distribution of yellowtail and capelin larvae, significant impact is possible. Further, we believe the proponent has overlooked the possibility of impact on the unique and important bivalve (Mesodema) community on the Southeast Shoal. Incorporation of significant amounts of oil into the sediments of this area could affect the important benthic-pelagic coupling (of which Mesodema must be a critical component) which operates on this portion of the Grand Bank. When one considers that the Grand Banks water column is not stratified except in summer, the relative shallowness of the Southeast Shoal, and the opportunity for mixing and settling of oil particles, we cannot concur with the assessment on p. 81 that the sea floor concentrations of hydrocarbons will remain at background levels (at least over the short term).

5.0 MITIGATION

In general, we accept that for a conceptual project both impact prediction and necessary mitigation has to be generalized. While we accept this and recognize the whole exercise as being a planning one, it leads to significant difficulties in design of plans to test the overall effectiveness of installed mitigation. This should be a key component of effects monitoring. Without specific mitigation proposals and testable hypotheses regarding their effectiveness one is left with significant apprehension regarding the value of any stated mitigations at this point in time.

5.2 Environmental Impact Assessment

--- p. 99:

Whereas the proponent has identified only two routine discharges of any environmental significance, we are of the considered opinion that a third - storage displacement water - warrants serious consideration. Proposed mitigation would include (1) on-board treatment (if necessary to meet existing regulatory requirements) and (2) deep water release.

6.0 RESIDUAL IMPACTS

6.1 Residual Impacts from Routine Events

--- p. 105 (Table 6.0-1):

We generally concur with the proponent's assessment of additive impacts on pelagic and benthic organisms, during the operational phase, with and without discharge of produced water below the summer thermocline. We state, again, however, that discharge of oily storage displacement water is also a concern with respect to additive impact and that its significance is determined by its location (depth) of release.

We are somewhat puzzled by the proponent's consideration that there will be no impact upon zooplankton and ichthyoplankton from repetitive/chronic insult. If we accept that there will be either "negligible or minor" impact on the above two components from additive insults, and if we assume that these additive impacts occur annually over the operating life of the project, therefore these additive impacts are in fact repetitive on the broader time scale. On this basis we would argue that repetitive impacts be rated 0/1 for zooplankton and ichthyoplankton on the basis of depth of discharge of produced and storage displacement water.

--- p. 106:

At the risk of repeating ourselves, consideration of storage displacement water release depth at the design stage is important in mitigating the overall additive/repetitive impact on biota during operations.

--- p. 107 (Table 6.0-2):

While we generally concur with the impact rating of 0-1 for adult salmon encountered over the Grand Banks, we do not agree that for all major accidental events a "negligible" rating is appropriate for larval yellowtail flounder and capelin. For a summer, surface blowout we have already stated that the impact could be significant (i.e. "minor" using the proponents ranking scale). Given that we have stated some reservations regarding the maximum size of the batch spills suggested by the proponent as worst-cases, it is conceivable that "minor" impacts could result from these spill events as well as from surface blowouts.

--- p. 108:

The proponent's recognition that the issue of additive/repetitive/chronic residual impacts is difficult to resolve even on a project-specific basis points out the even more difficult task of assessing these impacts on an area-wide basis assuming multiple offshore developments. By way of illustrating this problem, the NORDCO (1984) fisheries study suggests: "Thus, although in some areas the direct impacts of Hibernia development may be slight, the Hibernia development can be expected to stimulate other exploration and development activities which could result in cumulative impacts. At this time their significance cannot be evaluated." The need for area-wide, cumulative impact assessment is obvious; who is to have the responsibility for this action and the actual methodologies to be employed remains to be resolved.

7.0 MONITORING

7.2 Compliance Monitoring: Effluent Emission Discharge Monitoring

7.2.1 Canadian Compliance Monitoring

--- p. 120:

Reference is made to regulated levels of hydrocarbons in produced water; do the appropriate regulations (i.e. Canada Oil and Gas Production Regulations) apply equally to storage displacement water?

7.3 Effects Monitoring

--- p. 120:

Quite correctly, the proponent defines effects monitoring as per Thomas et al. (1984). The only problem that the proponent will experience in its commitment to effects monitoring of the Hibernia project is the impossibility of testing impact hypotheses given that we are dealing with a conceptual project with conceptual, generalized impact predictions! Somewhere along in the whole process the proponent must develop well-defined, testable impact hypotheses. This clearly cannot be done at this time and one wonders if there will be suitable mechanisms in place after the formal EIS review to ensure that effects monitoring is done in a meaningful and rigorous way.

--- p. 121:

While we generally concur with the proponent's stated philosophy that priority for monitoring effort will be given to "the study of long-term, chronic environmental effects . . .", we feel that effects of major, short-term or episodic events (i.e. blowouts, large batch spills, etc.) should not be ignored. While we recognize the inherent difficulties in monitoring/assessing the impact of rare, episodic events such as blowouts, it is only through the collective evidence gathered from case history study that we learn about the impact from such phenomena. While it can be easily argued that academia and government have the responsibility for improving knowledge on a generic scale, the responsibility of an industrial proponent is no less.

With respect to monitoring the effects of near-shore and on-shore support/construction activity, we concur with the proponent that the responsibility really rests with the individual contractor or project management consultant. This does not, however, absolve the Hibernia project proponent from any responsibility for ensuring that contracted project components are suitably assessed for environmental impact.

7.3.1 Worldwide Experience

--- p. 122 (7.3.1.1):

Some key documents relating to North Sea monitoring experience (e.g. Davies et al. 1981) are not cited in this section (although they are listed in the references).

DFO recognizes the inherent value of focusing on benthic organisms in effects monitoring. Caution is expressed, however, over any plans to focus exclusively on benthos at the expense of Valued Ecosystem Components having a pelagic existence. We would be equally concerned if the approach to benthic organism monitoring focused too heavily on parameters such as abundance, distribution, population change, etc. Inherent problems with

natural variability and sampling design invariably lead to problems. Individual organisms responses hold more promise for effective measurement and interpretable results. In this regard we suggest that monitoring focus on a variety or suite of impact indicators and that considerable weight be given to sublethal effects as evidenced by histopathological, physiological and biochemical responses.

--- p. 123 (7.3.1.1):

There seems to be some confusion regarding the role of mixed function oxygenase (MFO) as a monitoring tool. Measurement of MFO induction in finfish or marine mammals is not a sublethal response that in some way can be extrapolated to impact at the population level. MFO induction represents a first line of defense in fish and mammals whereby toxicants (such as hydrocarbons), in low concentrations, can be detoxified. MFO induction is therefore a very powerful tool for establishing the boundaries of influence of chronically-spilled oil. Its use is restricted to what has recently become commonly known as "comfort monitoring". In other words, it establishes the maximum limit of effect - no effect and therefore permits the establishment of an area of effect for more specific monitoring of acute and sublethal effects. MFO is one of the simplest and cost-effective tools available to establish effects monitoring boundaries.

--- p.123 (7.3.1.3):

The proponent indicates that monitoring specifics will come later but the stated general philosophy on the subject of monitoring is somewhat disappointing. In effect, the statement rejects the king-pin of environmental impact assessment which is to focus on valued ecosystems components. In the case of the Grand Banks and the general Newfoundland area, this should include fish and fisheries as well as birds. This disregard or oversight for VECs is apparent in the short section on monitoring where it seems that emphasis will be placed on measuring the abundance and species composition of benthic communities around rig sites. Monitoring will focus on what might be termed a relatively invaluable ecosystem component, a component which is already well known to be impacted - namely invertebrate populations in the immediate proximity of the rigs. All other biological components are to be disregarded since they are believed to be too highly variable, difficult to measure or interpret. But this includes fish, which are really the primary VEC (besides birds) in the development area. The primary purpose of environmental effects monitoring is to (a) address impact prediction uncertainties and effectiveness of mitigation measures and (b) to provide assurance or confidence that hypotheses and viewpoints are reasonably correct. And it is a contradiction of all stated terms and objectives if VECs are not included in monitoring programs. Probably some of the oversight pertaining to fish VECs is due to unfamiliarity with the levels of hydrocarbons which can produce sublethal effects in fish (as well as other organisms). Actually these levels are now known to be much lower

than that, for instance, stated in the reference by Marchand and Caprais (Page 81). Also, in reference to interpretation, there are methods available for predicting the extent of any biological or tainting impacts on fish.

Also, on the technical side, it has to be emphasized that any potentially important toxic or tainting levels of contaminants for VECs will be accommodated in the water column as they disperse from the development site. Thus at any point in time, the concentration dissolved or otherwise surfacing in the water column will present more of a day to day concern for VECs. On the other hand, significant impacts on benthic invertebrates will normally be anticipated to occur only within close proximities of the rigs when particles are settling in relatively high concentrations.

It should also be noted that reliance on chemical analysis alone can be an insensitive indicator of hydrocarbon contamination, since parent hydrocarbons may "disappear" quite rapidly with high levels of by-products being retained in tissues. In essence, an animal may be grossly impacted yet the evidence will not be forthcoming by reliance on the analysis of parent hydrocarbons. Thus it has to be stressed that any impacts on important VEC can only be addressed by complementary chemical and biological monitoring techniques - actually as indicated, the Document does not even recognize the importance of any monitoring techniques, chemical or biological, for anything other than benthic communities adjacent to rig sites.

Biochemical, physiological, histopathological, and tainting indicators have been developed and can be used to assess concerns related to fish impacts. It has to be stressed that one of the primary values of indicators is their power to provide assurance, and assurance is in the best interest of all concerned. For instance, the question was being asked whether oil development was adversely impacting fish populations in the North Sea. When such hydrocarbon sensitive sublethal indicators as MFO enzyme induction were not found, or only found within short distances from the rigs, this provided strong "assurance" arguments that fish populations were not being impacted to any extent.

On the other hand, should effects be impugned or indicated to occur some distance from rig sites, indicators can provide economical and simple tools to assist in delineating areas of "effect/no effect" for more in-depth investigation. Also, since individuals respond to sublethal stressors before effects are apparent in populations, the merit of such studies is the early warning that can be signalled concerning possible environmental impacts/no impact.

Acceptance of a level of biological monitoring similar to that being carried out in the North Sea on VECs is a necessity. It also has to be stressed that the cost of such studies will be quite trivial compared with the outlays for benthic surveys around rig sites.

Two species of finfish that we believe to have significant promise as monitors are the sand lance and the yellowtail flounder. Both species are found in intimate contact with bottom sediments and are abundant. The sand lance has the added advantage of having a semi-pelagic existence. Because MFO induction in most invertebrates is non-existent or of questionable value, these two species of finfish offer excellent potential as indicator organisms.

Finally, as stressed in the Beanlands and Duinker study (An Ecological Framework for Environmental Impact Assessment in Canada), any project must be considered in an experimental context in which monitoring is required to test various hypotheses and impact predictions. And, as they noted, this is the only concept of impact assessment in which the independence of various activities, baseline studies, prediction and monitoring became coherent in a scientific sense.

7.3.2 Offshore Effects Monitoring Program at Hibernia

--- p. 124

As referenced above, while the focus of an effects monitoring program for Hibernia should be on near-field, chronic discharges, the distant-field, episodic discharges should not be ignored. We believe that the proponent should address, at least in a broad way, the issue of monitoring or assessing the areal extent and nature of impact for potentially damaging episodic spill events. In this regard, it is suggested that establishment of a "baseline" for the behaviour of a chosen suite of impact indicators (largely on the sublethal side) throughout the Grand Banks ecosystem is prerequisite. As for fine-scale effects monitoring of chronic discharges, the "suite of indicators" for broad-scale monitoring should utilize histopathological, biochemical, and physiological parameters.

Metric Conversion Table

--- p. 235:

As in a comparable table in the Venture EIS, there is lots of scope for confusion! The most obvious and consistent error here is that the "=" sign is in the wrong place: if you multiply 1 nm by 39.37×10^{-9} , you get 3.937×10^{-8} nm ... not one inch. (But if you multiply 1 in by 39.37×10^{-9} , you will get 1 nm.) And 10.76 m^2 is not 1 sq ft ... and so on. Alas, this is not a consistent error: $(1.8 \times ^\circ\text{C}) + 32$ does, indeed, equal $^\circ\text{F}$. There is something especially wrong with the pressure conversions: if 1 kPa = 0.145 psi, (correct) then 1 Pa ($10^{-3} \times 1 \text{ kPa}$) must be 0.145×10^{-3} psi. Similarly, if 1 kPa = 10^{-2} bar (correct) then 1 Pa = 10^{-5} bar. While we don't suppose anybody will actually use this Table for calculation, we can't help feeling that if the proponent doesn't copy out a conversion table correctly, how can we believe anything else they say?

VOLUME IV - SOCIO-ECONOMIC ASSESSMENT

2.0 SOCIO-ECONOMIC SETTING

In general, two principles should underlie socio-economic advice or evaluation in an exercise such as we see with the review of the Hibernia EIS. These principles, simply stated, are as follows:

- 1) Establish whether or not the overall likely social benefits exceed the overall likely social (including environmental effects) costs; and,
- 2) If the overall benefits exceed the overall costs, then those that gain from a project are capable of compensating those that lose from the same project.

In following these two guiding principles, the overall DFO impression of the socio-economic assessment is as follows:

- 1) Social valuations need not always equal private valuations. For example, the social and private interests may use different rates to discount the benefits and costs that accrue over time, leading to different valuations of the present value of the net benefits associated with the project. The proponent may also not assign a value to factors that are outside the marketplace, such as pollution, that do not represent the full social costs of such phenomena. The valuation of the flow of benefits and costs also requires some provision for the likelihood with which the events may occur. An event that is unlikely to occur, whether of a large or small impact, must be weighted differently than an event that is more likely to occur.

The Hibernia EIS did not include an explicit assessment of the benefits and costs associated with the project since it is outside the Terms of Reference. Nevertheless, for the project to be acceptable the primary benefit associated with the project, the net present value of oil production, would have to be sufficient to meet all the social costs associated with the project. A cost:benefit analysis of the Hibernia project would include some difficult valuation problems. For example, what is the prevailing oil price over the production period? What is the recreational, or perhaps ecological value of a seabird population that may be affected by the development? What is the likelihood assigned to the various biophysical and socio-economic impacts associated with the project? The valuations placed on such impacts cannot be taken as definitive measures, however, cost:benefit analysis provides a framework within which the relative magnitude of the impacts can be considered.

DFO's assessment of the EIS has therefore taken place without an explicit appreciation of the overall ratio of the benefits and costs associated with the project. We do not know the magnitude by which the

expected benefits exceed the project costs which would determine the overall value of the project to society.

In the absence of an assessment of benefits and costs, DFO is left to assume that the likely social benefits from the project are of sufficient magnitude to bear the likely social costs from the project. In particular, we assume that the likely social costs to the fishery or fish habitat are such that they can be borne by the overall social benefits to be derived through the development of Hibernia. Nevertheless, there remains the necessity for DFO to recommend, and press for, action to increase the ratio of benefits to costs.

- 2) Because DFO accepts that overall social benefits outweigh social costs, it is desirable that such compensations be paid. At the 1983 panel hearings on the Venture EIS the DFO position was that the compensation schemes must be acceptable to all segments of the fishing industry. Since that time DFO has developed a draft departmental position on liability and compensation by proponents relative to oil and gas activities and have provided COGLA with same. It is doubtful that guidelines for compensation, being prepared by COGLA, will be finalized in time for the panel hearings on Hibernia. This Department will be finalizing its position on compensation and liability with respect to oil and gas prior to the presentation of its overall position on the Hibernia EIS to the panel. Mobil has not as yet presented its own policy on compensation for directly attributable damages although a general agreement does exist between the fishing industry and the Offshore Operators Division of the Canadian Petroleum Association regarding non-attributable damage.

The lack of a compensation policy for directly attributable damages to the fishery is a major deficiency of the EIS. DFO is forced to accept that project benefits will outweigh social costs and we are further forced to accept the proponent's assurances that these costs will be compensated. At present the proponent doesn't even have an overall stated policy for compensation, let alone a specific scheme for fisheries. At several community information sessions the proponent has suggested that it may take upwards of a year to put the compensation package into place. It is our considered opinion that this should have been done already and expressed publically in the EIS.

2.4 The Fishery

2.4.1 Overview of the Newfoundland Fishery

--- p. 44 (2.4.1.2):

Very superficial treatment of the contribution to provincial GDP. Is one year (i.e. 1983) adequate to compare these data? We would think a 10-year period to be a minimum for this type of comparison. We are attempting to look at a fabric and not as is done here, a single thread.

--- p. 48 (2.4.1.5):

The statement that "the 80 Newfoundland vessels accounted for 70 percent of the 1979 Canadian catch off the south coast and on the Grand Banks . . ." conflicts with what is stated on page 30 of the NORDCO (1984) fisheries study where it is suggested that the Newfoundland trawler catch represents 70% of the total catch (i.e. Canadian and foreign combined). The suggestion that the foreign catch on the Grand Banks is 27% seems to be erroneous unless you include the nose and tail of the Bank and the Flemish Cap. This should be clarified.

It is stated that in winter the major fisheries are in northerly areas for cod. This may have been true until enterprise allocations (i.e. company quotas) become a dominant feature of offshore fisheries. During winter 1985 the major FPI fishery was for flounder on the Grand Bank. This, once again, points out the inherent difficulty in categorizing fishing patterns and distributions.

The choice of statistical unit 327 (which encompasses the Hibernia development area) to represent the fisheries conducted in the area of the project site is understandable. However, given that the Hibernia field is located in the extreme northeast corner of statistical area 327, and that there is significant variability associated with catch/effort data from such a relatively small area, it may have been wiser to utilize a larger area encompassing Hibernia. In that regard, averaging of catch/effort from areas 326, 327, 328, and 329, on a seasonal basis, may have generated results having more confidence associated with same. This broader data base may or may not have led to different conclusions.

--- p. 50-51 (Table 2.4-2):

In a simplistic way, one could easily interpret the apparent change in distribution of trawl sets for plaice from 1979 to 1983 as a reflection of the general avoidance of the Hibernia area by trawler skippers. Pre-1979 data would be helpful to ascertain if, in fact, this happened.

2.4.2 St. John's Impact Area

--- p. 54 (2.4.2.2):

In addition to the gear types mentioned for Conception Bay there are also fisheries by capelin traps, squid traps, and linetrawl for cod especially during August-October in depths of 35-75 m

Squid traps would be concentrated around Holyrood, Harbour Grace, and Bay Roberts harbours. There is also some gillnetting for flounder on the western shore of Conception Bay and lumpfish around the Bell Rock.

2.8 Land and Resource Use

2.8.1 Newfoundland

--- p. 120 (2.8.1.4):

A major salmonid fish encountered in southeastern Newfoundland is the brown trout.

Four southeastern Newfoundland salmon rivers are suggested to have fishing effort of "between 1 and 2000 rod days . . .". This is more accurately stated as "between 1,000 and 2,000"

2.8.2 St. John's Impact Area

--- p. 129 (2.8.2.5):

The brown trout is a very important salmonid resource within the St. John's Impact area and is particularly noteworthy in St. John's area streams such as Rennie's River. This should be clearly stated.

2.8.3 Come-by-Chance Impact Area

--- p. 133 (2.8.3.5):

The recognition of the importance of Piper's Hole River as a scheduled salmon angling area is critical given the identification of the area as a major, continual source of construction aggregate (page 120). The proponent should be aware that DFO has salmon enhancement plans for this river.

4.0 SOCIO-ECONOMIC IMPACTS

4.0.1 Community Concerns and Questions

--- p. 174-175 (Table 4.0-1):

The suggestion that community concerns have changed their focus during the period of the early 1980's to 1984 is quite understandable and somewhat predictable, in hindsight. Given the increased rural unemployment rate to unprecedented (i.e. since Confederation) levels over the 3- to 4-year period, it is not surprising that concern now relates more to employment opportunities than to impacts upon the fishery or environmental issues. This shifting of focus, however, should not be taken as a signal that fisheries and environmental issues are no longer important. Rather, it should be considered as a temporary rearrangement of individual and collective priorities. Concerns for impact upon the fishery and the environment are still in people's minds, however, for the moment they "take second fiddle" to issues relating to employment. It is

interesting to note in Table 4.0-1 that whereas issues respecting environmental impact generally seem to have been displaced, those relating to fish and fisheries have remained important.

4.6 Impacts on the Fishery

4.6.3 Benefits to the Fishing Industry

--- p. 248:

The suggestion is made that fishery management capability may be strengthened as a consequence of Mobil's ongoing collection of information on the oceanography and marine climate of the Grand Banks. While this suggestion has some validity in the long term, unless the presently experienced data collection programs are better coordinated with DFO interests, this may not happen. In other words, the mere collection of oceanographic data does not ensure improved fisheries management capability.

4.6.4 Impacts

--- p. 249 (4.6.4.1):

The estimated catch and value of plaice from the 414 km² effective exclusion zone is based on 1979 to 1984 fishery data (DFO Observer Program, commercial catches, trawler skipper's log, and fishing vessel sightings from operating rigs). There seems to be no question that the consistent and repetitive fishing patterns after 1980 appear to suggest a recent stable effort location. DFO examined another data set (sighting records of DFO patrol vessels and DND aircraft for 1984) and confirmed a pattern not too dissimilar from that outlined in the NORDCO (1984) study. In general, we can now say that fishing surrounds Hibernia to the east, west and north. However, we are hesitant to extrapolate this present pattern to the period prior to the inception of intensive exploration in the Hibernia area. It is not inconceivable that the presence of rigs could have altered effort location resulting in the current post-1979 pattern which may be different from the historic one. For example, the 1979 and May 1980 information, based on DFO observer data (p. 62, NORDCO, 1984 report), shows effort close to the western side which is seen less in ensuing years and catch rates (reflecting abundance) appear to be quite good near Hibernia. Using the foregoing argument then, it must be considered that calculated losses of catch could be minimal. In any event, it is recognized that it is likely that future development at Hibernia will have a relatively small effect on domestic trawler fisheries in terms of post 1979 observations. This, of course, is based on the assumption that fish distributions and migrations routes are constant. However, we know that what today is not a particularly significant area might well become very important in view of the dynamic shifts in centres of distribution and migration over short spans of time. Witness for example the changes in distribution and migration of the West Greenland

cod stock, the feeding concentrations of salmon at West Greenland, the population expansion, and extended distribution of yellowtail on the Grand Bank and the fluctuations in the distribution and migrations of squid and mackerel.

The above general assurance notwithstanding, the NORDCO 1984 study (p. 57) clearly states that trawler operators are concerned with any loss of access to flatfish grounds. While these operators may be prepared to accept a single exclusive zone of some 400 km², it is obviously considered as the "tip of the iceberg" or "thin edge of the wedge" as far as any future development is concerned. The issue is therefore not so much the immediate 400 km² but the prospect of several of these exclusion zones occurring over the life of several fields.

The situation is further heightened if these areas are not returned to "trawlable" conditions during abandonment.

--- p. 250 (4.6.4.1):

The proponent alludes to "possible interference with these fishing activities . . ." from use of identified fishing berths and locations near the site of construction of the GBS. Yet in the NORDCO (1984) study (p. 48) it is clearly stated that lobster and cod trap fishermen would be displaced for the duration of the construction period. The proponent should state approximately how many would be involved and how this impact would be mitigated (i.e. compensation).

--- p. 251 (4.6.4.3):

The impact of a major offshore oilspill is understated in our estimation. Reference to contingency plans for containment and clean up fails to admit that sea state limits any such operation to about 20% of the time and that under most conditions the "do nothing" option is the most probable action. The proponent also fails to reference the NORDCO (1984) study (page 86) which clearly states that "A large spill could impact upon the activities of most of the Newfoundland trawler fleet engaged in fishing summer months on the Grand Banks". The proponent suggests, in a somewhat cavalier way, that "fishing activity may be temporarily displaced from areas where oil is on the water." There is no indication whether or not this would be a voluntary or enforced preemption of fishing activity. Further, while it is admitted that the consequences of preemption may be serious, there is no mention of possible compensation. Beyond the potential for direct impact upon the harvesting sector of the industry lies a somewhat reduced, but still significant potential for disruption of the processing sector. While information is provided in the NORDCO (1984) study of possible losses in the processing sector, these are ignored in the EIS per se. If we assume that the information provided on page 85 of the NORDCO study and pages 75-76 of Volume IIIB of the EIS are correct, it is conceivable that an oil slick from a worst-case summer surface blowout could cover most of the area of

the Grand Banks. If this were to happen, re-deployment of the offshore trawler fleet will be all but impossible. Resulting impacts on the processing sector would be serious, especially for seasonal plants. The proponent should outline its policy for compensation to the harvesting and processing sectors should loss of catch occur. The existing policy for non-attributable damages includes compensation for loss catch by the harvesting sector, at least.

Fish tainting per se has been downplayed while the only potential issue is seen as public perception of taint. While we do not necessarily concur that tainting per se will not be a problem, we feel that even the issue of perception of tainting is understated. In the event of a major spill, it is likely that tar-balls will be found in large concentrations in the offshore. As seen in the case of the small KURDISTAN spill, even such "visual" statements of pollution will likely present major fisheries concerns.

While the proponent references the potential for tainting of catch, preceptions of same, and the resultant reduced market accessibility they offer no mitigation in the form of compensation. Will this "cost" be covered in the proponent's new compensation policy for directly attributable damages?

--- p. 252 (4.6.4.3):

While we generally concur that spilled oil is unlikely to reach shore, we feel that the proponent has dismissed the issue somewhat prematurely. While the EIS recognizes problems could occur if oil comes ashore, no solutions are offered. Again, where would the proponent's compensation policy stand on such issues?

--- p. 253 (4.6.4.4):

The potential for attraction of skilled labourers (i.e. pipefitters, welders, marine electricians, etc.) away from the fishing industry's refit centers is real because of wage differentials between that industrial sector and oil-related construction. This problem could be acute (admittedly in the short term perhaps) for the FPI trawler refit center in Burin if the Marystown Shipyard expands its workforce beyond 650 persons. The refit center has built up a stable workforce over the years and there is concern in the company that even short term losses to Marystown could be critical given the general shortfall in similar trades in the province (see p. 214). It is insufficient to suggest that "In the long term, an increased regional or provincial skilled labour pool improves the prospects for trawler refit capability" - what does the fishing industry do in the interim?

One indirect threat that oil development does pose to the fishing industry is the effect of wage escalation in the processing sector. Wage escalation may prompt plants to increasingly mechanize their processing

operation. Substantial potential exists to substitute capital for labour in fish processing and whereas in certain instances, mechanization may improve plant viability, it would also further worsen the Province's already crippling unemployment problem. The viability of the industry would also be adversely affected by any escalation in wages that was not offset by higher prices or lower unit production costs. The cause of stabilizing the level of productive employment in the fishery would be well served by a project design that minimized those aspects of the project that would prompt undue and temporary wage escalation. The impact of wage escalation on the fishing industry is also not limited only to the immediate impact areas as collective bargaining would, to a certain extent, transfer such impacts throughout the industry.

4.6.5 Mitigative Measures

--- p. 254 (4.6.5.1):

The production of monthly maps showing the location of fishing and offshore petroleum activity is a good concept, however, the maps presently being produced are of a scale that is much too coarse to be really meaningful.

--- p. 254 (4.6.5.2):

The promise is made that the seabed of the development site will be surveyed at abandonment to determine if cleanup of debris is necessary. Since a policy of "good housekeeping" is to be instituted then it follows that cleanup should be automatic and this should be a stated policy, up front, at this time. Reference to Mobil's policy for compensation of directly attributable debris damage to gear is only alluded to in a shadowy way by reference, in turn, to government policy and statutes. Mobil's compensation policy for debris damage should be clearly stated at this time.

--- p. 255 (4.6.5.3):

The possibility of tainting of offshore catch is offhandedly dismissed in the EIS. Should oil spills result in large-scale oil slicks with resultant high ppb/low ppm hydrocarbon concentrations in the water column, the possibility is not that remote. Consider the recent results published by Zitko et al. (DFO Tech. Report No. 1305, 1984) who measured contamination of Scotian Shelf fish by gas condensate from the Uniake G-72 blowout. These workers conclude that "... gas well blowouts could lead to considerable contamination of fish. The contamination may last for a few months after the event." Surely the case for oil is equally or more severe.

Unfortunately, the proponent does not divulge compensation policy or plans in the event of tainting of catch but rather suggests that any

response or monitoring will be determined after results of an ongoing study are in.

--- p. 255 (4.6.5.4):

As stated elsewhere in our review of the EIS, DFO is concerned that the seafloor around the development site may not be fully restored to a fishable condition at abandonment. It is our position that the seafloor be returned to a "trawlable" condition wherever technically feasible. This includes the removal of all sub-sea components without exception. Further, we are of the opinion that all dredge spoil heaps, trenches, cutting piles, etc. be manicured and made "trawlable". The importance of this latter action is highlighted in the NORDCO (1984) fisheries study (p. 52) where it is clearly stated that otter trawls rigged for flatfish are especially sensitive to anything but a smooth seabed.

4.8 Impacts on Public Services, Commercial and Industrial Infrastructure

4.8.2 Newfoundland

--- p. 273 (4.8.2.7):

No reference is made to services provided to the oil and transportation industries by DFO. These services include hydrographic surveys and chart production, production of oceanographic data products, marine environmental data archiving, general provision of advice and information, and regulatory responsibilities for fisheries management and habitat protection. Existing services and programs will come under increasing pressure as a consequence of the Hibernia project. This should be referenced and addressed.

4.10 Impacts on Land and Resource Use

4.10.3 Fixed Production System

--- p. 319:

Reference is made to short-term increased harvesting pressures on natural resources such as salmon (and trout) in the Come-by-Chance area if the GBS is constructed there. The proponent should consider the pros and cons of prohibiting fishing by work camp markers for the duration of the project. This action has been taken by other industrial proponents (although usually in wilderness settings) to protect fish stocks and wildlife from dramatic overharvesting during the life of the project. Because salmon and trout fisheries are not "limited entry" by nature (i.e. anyone can fish in any given area) the effort cannot be regulated by DFO except by closure.

--- p. 320 (4.10.3.1):

The potential serious impacts upon Piper's Hole River from aggregate extraction and access dredging have been referenced elsewhere in our review. The necessity for immediate consultation with DFO in this issue is again highlighted.

4.10.4 Mitigative Measures

--- p. 323 (4.10-4.1):

Reference to potential use of Placentia Bay islands as source of aggregate also concerns DFO. Our concerns relate to lobster habitat and herring spawning areas. Impacts of fines from crushing and/or washing operations on fishing activities are also possible. Early consultation with DFO is imperative.

4.13 Summary of Enhancement of Beneficial Impacts and Mitigative Measures

4.13.2 Mitigation of Negative Impacts

--- p. 336:

With respect to mitigation of negative impacts upon the fishery, the proponent promises a compensation policy. No schedule for the development of this policy is given and therefore we are asked to accept the general commitment. We should have had access to such a policy during our review of the EIS in order to evaluate which potential impacts would be mitigated and which ones would not. This is a deficiency of the EIS.

4.13.3 Monitoring

--- p. 338:

The suggestion that a monitoring coordinating body be established is a good one in principle. In practice, its ability to assign direct responsibility to government departments and ensure follow through is probably naive. Using DFO as an example, it is not unusual to see formal recommendations from environmental assessment panels which, if implemented, would create significant new workloads in various sectors of the department. The recommendations of the Beaufort Sea Panel are a case in point. Whereas current DFO budgets allow for departmental participation in the EIS process, approved budget levels do not include allowances for responding to Panel recommendations generally or post-construction monitoring specifically. Given that DFO's operating procedures are not unlike those of other federal and provincial agencies, implementation of Panel recommendations is indeed difficult. This is an important point to be kept in mind by the Hibernia Panel.

GOVERNMENT OF CANADA DEPARTMENT OF
REGIONAL INDUSTRIAL EXPANSION
TECHNICAL REVIEW OF HIBERNIA
DEVELOPMENT PROJECT ENVIRONMENTAL
IMPACT STATEMENT

AUGUST 1, 1985



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of Canada

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du Canada

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Expansion

Expansion industrielle
régionale

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July 31, 1985

Hibernia Environmental Assessment Panel
P.O. Box 1505, Stn. "C"
St. John's, Nfld.
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Dear Sirs:

We are pleased to submit our technical review of the Hibernia Environmental Impact Statement for your consideration.

Our intention in preparing this review is to promote the better management of opportunities arising from the Hibernia Development Project and to mitigate any obstacles or constraints to potential benefits which may occur. At this time, no decision has been made regarding the nature of our participation at the public hearings. Our role in these hearings will be influenced by the type and timing of the response which we receive to our review.

The executive summary provides a brief discussion of DRIE's mandate as the basis for our concerns and interests, followed by the various issues which our review of the EIS uncovered. Greater details regarding these issues and our concerns are contained in the body of the document.

We would be pleased to discuss with you in detail any aspect of our technical review and present our findings should the need arise.

Yours truly,

P. J. Bates
Director
Regional Benefits,
Analysis & Planning

PJB/jk
Attachment

Canada

c.c. G. Pisarzowski

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EXECUTIVE SUMMARY

The objective of Regional Industrial Expansion (DRIE) is to increase overall industrial, commercial and tourism activity in all parts of Canada and, in the process, reduce economic disparity across Canada. This objective is achieved through a variety of programming mechanisms including:

- working with business and labour, other governments and the academic community;
- shaping the framework set by government policies;
- providing financial, marketing and other technical information to businesses; and
- where necessary, extending direct financial assistance.

The Hibernia Development Project (HDP), if properly managed, can foster a climate which will encourage firms to enter into the production of goods and services for offshore oil development and production and ultimately lead to their international competitiveness. This can be accomplished through:

- developing new products, processes and services;
- establishing and modernizing this production;
- marketing these goods and services at home and abroad; and
- restructuring the firm's activities to adjust to changing market conditions.

To be successful, however, requires that Canadian companies not only have an opportunity to participate in this new sector (offshore oil and gas) but that the necessary skills and training are in place to ensure their competitiveness. The responsibility and role of DRIE is to ensure that Canadian industry can, and is given every opportunity to respond competitively to the needs of the offshore oil and gas sector. This responsibility places DRIE in a unique position to examine the industrial, economic, and Canada benefits aspects of the HDP.

(ii)

DRIE's technical review of the EIS focuses on the socio-economic impact statement (SEIS) and addresses a variety of related issues including the completeness of the SEIS, the socio-economic impacts of the HDP, and the ability of the proponent, government and communities to deal with the issues.

Specifically, the major concerns which the review has raised can be briefly summarized as follows:

- i) The purpose of the EIS is to identify issues, assign responsibilities, develop action plans and appropriate monitoring programs. The Hibernia EIS has only qualitatively identified issues within a series of narrow assumptions. The assignment of responsibilities for action plans to deal with issues, the development of monitoring programs and the quantitative identification of issues within a sensitivity and risk analysis framework have not been accomplished.
- ii) Recognizing that impact prediction at best is an imprecise exercise, the emphasis in dealing with socio-economic/industrial development issues must be on the need for contingency planning.
- iii) As a planning document, the EIS fails to provide any sensitivity or risk analysis thereby creating an impression of precision in impact estimation where none exists.
- iv) The EIS projects labour and resource demands on the basis of an ideal engineering and development schedule. However, it fails to recognize what effect an accelerated development schedule could have on satisfying these demands.
- v) The definition of impact area is unclear, in particular, the rationale for excluding Marystown as an impact area.
- vi) The failure to consider the combined impacts of the project on Marystown, Argentia, and Come by Chance and the potential for communities to compete for common resources.

(iii)

- vii) The reluctance to place Hibernia within a realistic economic environment recognizing that it is one of a number of potential projects within the forecast horizon.
- viii) The relationship of exploration activity to PIP grants and the rationale for the possible drastic reduction in exploration activity by the multi-nationals.
- ix) The influence of Hibernia on inflation has been downplayed in the EIS. However, price increases for goods and services may occur as a result of the project. Mobil should have undertaken a sensitivity analysis regarding the inflationary effects of the HDP.
- x) The EIS underestimates the influence of the HDP on population growth by failing to recognize the influence of reduced out-migration coupled with underestimating in-migration.
- xi) The EIS does not consider the ability of the housing industry and government to respond to the various housing demands that the HDP will likely generate.
- xii) The EIS assumes a static economic environment as far as industrial investment related to the offshore is concerned. The wealth of North Sea, Norwegian as well as Gulf Coast experience could shed light on the direction and nature which this investment could take.
- xiii) The EIS, in terms of Canada Benefits, states that the Canadian industry will be given a fair opportunity to bid, assuming international competitiveness yet points out that Canadian industry will never be internationally competitive. No resolution of this dilemma is offered.
- xiv) The EIS states a number of clear policies regarding Canadian Benefits yet fails to address their implementation.

1.0 INTRODUCTION

The Department of Regional Industrial Expansion (DRIE) has reviewed the Environmental Impact Statement (EIS) prepared for the Hibernia Development Project (HDP) located off the Atlantic coast of Canada approximately 300 km east-southeast of St. John's, Newfoundland. The scope of the project includes development drilling, construction of production and storage facilities, operation and maintenance of production facilities, transportation of oil and abandonment.

Specifically, DRIE has examined various documents including the relevant background material regarding the environmental (socio-economic) consequences of oil production from the Hibernia Field prepared by Mobil Oil Canada Limited and its consultants, May 1985.

Hibernia Development Project Environmental Impact Statement

Volume I - Summary

Volume II - Project Description

Volume IV - Socio-Economic Assessment

DRIE's primary concern focuses on the industrial development implications of the HDP and the type of climate and supports such a project will create to foster national and regional industrial development and diversification. Industrial development is influenced by a combination of factors including trends in population growth, employment and investment as induced by the HDP. DRIE's interest and responsibility for encouraging economic development places it in a unique position to comment on the socio-economic and

Canada benefits aspects of the project.

This document provides a technical review of the Socio-Economic Impact Statement (SEIS) portion of the EIS. It addresses such issues as the completeness of the SEIS, the socio-economic effects of the proposed alternatives and the ability of the proponent, government, the private sector and communities to respond to the demands of the project and to deal effectively with the issues.

The initial section in this submission examines the SEIS (Vol. IV) as a planning document and reviews its contents in light of the requirements as defined by the Terms of Reference. Issues are raised regarding the admission of uncertainty, the use of sensitivity and risk analysis, the definition of impact areas, the emphasis on a qualitative as opposed to quantitative approach, the failure to place Hibernia within a realistic economic context, and the lack of consideration given to the combined effect of impacts on communities.

Subsequent sections analyze in greater detail specific socio-economic and benefits issues such as predictions regarding population growth, labour and housing demand/supply, inflation and programs to ensure the optimization of regional as well as national opportunities. In each of these issues, DRIE's examination focuses not only on the basis and method used to predict impacts but also on the recommended mitigative or enhancement programs, and the type of indicators utilized in the monitoring program.

2.0 THE APPROACH AND PURPOSE OF THE EIS

2.1 The EIS as a Planning Document

DRIE's review of the various EIS documents has led to the identification of not only a number of specific concerns but also several broader issues dealing with the EIS as a planning document, its study approach and its relationship to the Terms of Reference.

Mobil has stated that the EIS is based on a number of assumptions which will likely change as the project unfolds. Consequently, predicted effects are at best reasonable approximations. The EIS, therefore, is not just a technical document but is first and foremost a planning tool (pg. 3, Vol. I). Unfortunately, as a planning tool the EIS suffers several shortcomings, most notably the failure to admit to uncertainty in preparing estimates and the lack of sensitivity and risk analysis.

The dilemma in attempting to predict socio-economic impacts is that the outcome of an activity is often only really known as it occurs. This difficulty in predictive accuracy requires considerable effort and innovation in order that the range and magnitude of particular impacts can be defined. If the factor of uncertainty is not taken into account, estimated impacts will represent a level of precision that is misleading. This problem is best exemplified by the employment estimates (Tables 4.2-3 and 4.2-6 Vol. IV) which provide a single number per year for each trade category. Confidence levels for these numbers are not provided and neither is any discussion of their softness.

2.2 Admission of Uncertainty

This lack of uncertainty is further exacerbated by basing labour and resource demand projections on an ideal engineering and development schedule. Yet in one of the background documents Mobil's consultants state that:

"The North Sea experience with major offshore projects suggests that preliminary, project schedules are difficult to maintain ... there could be significant differences between the timing of Hibernia activities shown in Figures 1.2-3 and 1.2-4 and the length of time actually taken to complete the activities in question." (#3 Industrial Impact Assessment - Hibernia Development, pgs 10-11.)

Experience elsewhere has demonstrated that major complex projects like the HDP rarely keep to the original schedule. In fact, many of the North Sea projects were accelerated resulting in labour and resource demand peaks being four and five times greater than originally predicted. The EIS does not discuss the potential for project acceleration or deceleration and the influence it would have on the various economic and socio-economic estimates.

2.3 Sensitivity and Risk Analysis

A related problem to the uncertainty issue is the EIS's failure to provide any sensitivity and risk analysis for the various estimates. While it is acknowledged that

socio-economic impact estimation (no matter how skillfully done) results in an imprecise set of projections, what is often more critical is to develop a range of values based on a series of possible and probable assumptions. By varying assumptions regarding the way the Hibernia project could unfold, i.e., developing a base case and a worst case scenario, the question regarding possible alternatives is dealt with.

The issue of risk analysis is addressed by evaluating the probability that these scenarios could occur. Sensitivity analysis and risk analysis, i.e., a realistic examination of the "what ifs", combine to form the cornerstone of any planning document. These analytical techniques permit the development of action plans and contingency planning which form the basis of resource management. The lack of sensitivity and risk analysis in the EIS results in misleading estimates of impacts and its failure as a planning tool.

2.4 Definition of Impact Areas

In terms of study approach, Mobil's definition of impact area is unclear (pg. 6, Vol. IV). Marystown Shipyard is the largest and most up-to-date facility of its kind in Newfoundland. Its proximity to Argentia and Come By Chance, along with its shipbuilding capability, suggests that it could play a major role in the offshore. At the same time, it is currently engaged in shipbuilding and retrofitting activities. It is not clear whether Hibernia will add to the current demand or take up slack productivity; that is, will Hibernia create a negative or positive impact on Marystown? The rationale to exclude Marystown as an

impact area suggests that there may be other communities not identified as being impacted by the project. St. John's has been defined as an impact area. Similarly, it is unclear whether Hibernia will add to the current demand or take up slack since many of the activities demanded of St. John's are currently available. Therefore, the definition of impact areas appears to be inconsistently applied and the exclusion of Marystown and potentially other communities as impact areas is a major oversight of the EIS.

2.5 Identification of Issues

Mobil throughout Volume IV of the EIS identifies the socio-economic impacts related to the HDP and subsequently summarizes these impacts in Volume I of the EIS. The Guidelines for the Preparation of an Environmental Impact Statement (pg. 22) indicate that "Potential impacts in the area to be affected by the proposal should be discussed in terms of existing qualities, quantities and values..." While Mobil has identified impacts in a qualitative manner, a thorough quantitative analysis has not been undertaken. Thereby, no order of magnitude estimates have been provided as a basis for action plan development (mitigation and/or enhancement procedures). Failure to quantify impacts makes it impossible to assess governments', communities' or the private sector's ability to deal with them.

2.6 Combined Effect of Community Impacts

In terms of industrial benefits, the EIS identifies the following: Argentia as a potential site for flowline prefabrication; Come By Chance for the construction of the GBS; and Marystown for the production of a number of

components and sub-components such as ice-clearing vessels, riser bases, loading base production manifolds, etc., related to the development (pgs. 193-197, Vol. IV). The demand for resources generated by these activities will be quite similar, for example, fabrication services and a similar range of skilled trades. The geographic proximity of these communities can result in each placing demands on the same resource pool at the same time resulting in competing demands for goods and services. In fact, government is recognizing that competition between communities is occurring at the present time. Failure to examine this issue in the EIS has overlooked a resource management issue requiring contingency planning and monitoring.

2.7 Incremental Impact of Hibernia

Given that the intent of the EIS is to examine the incremental impact of the HDP on what is likely to happen over the next 15 to 20 years, the exclusion of a concurrent projects scenario represents a major deficiency in Mobil's submission. Section 5.4 of the 1980 Federal Guidelines for the Preparation of an EIS refers specifically to interrelationships with other proposals and projects. It states that:

"The proponent should specifically identify all associated projects that may be affected by the proposal and which in turn may cause environmental concern. Discuss interrelationships of such associated projects and the environmental concerns identified whether or not these concerns fall within the jurisdiction of the proponent and/or initiator". (Pg. 6)

More generally, the Newfoundland base case implies that, in the absence of the HDP, the provincial economy is in store for a significant contraction in employment prospects relative to employment under the Canadian base case (Table 4.3-9 compared to Table 4.4-4). Whereas the nation's employment situation improves, (albeit, the unemployment rate remains high) there is an absolute reduction in employment in Newfoundland between 1986 and 1994. The fact that the two paper companies in the Province are currently carrying out investments to improve their competitive positions (a positive indication) calls into question the reasonableness of the rather bleak forecast for pulp and paper. In fact, markets for newsprint for the medium to long term are improving particularly in the U.S., and both paper companies are positioning themselves from a marketing point of view to take advantage of this upswing. At the same time, potential gold development on the west coast and in Labrador and rare minerals in Labrador do indicate some possibility for growth in the mining sector.

In addition to presenting an incomplete picture of the provincial economy, the EIS assumes a static economic environment as far as industrial investment related to the offshore is concerned. While Mobil indicates in the EIS that investment is likely to occur (pg. 192, Vol. IV) no attempt is made to examine the nature and magnitude of this potential investment. The wealth of North Sea and Gulf Coast experience and particularly the post-development experience can shed some light on this issue.

3.0 SOCIO-ECONOMIC CONSIDERATIONS

3.1 Estimates of Population Growth

Population statistics are a basic indicator of economic activity. In many instances they form the basis from which other estimates are derived. As projections, they are a primary indication of future consumer demand for goods and services. As DRIE has a vested interest in industry's ability to be responsive to new demands and opportunities, a review of this subject was undertaken.

The population estimates provided in the EIS underestimate the true growth which will occur. No analysis has been conducted on population changes that may occur as a result of changing migration patterns. Specifically, the effects of reduced out-migration have not been considered. It is proposed that in light of perceived job opportunities at home, the usual outflow of Newfoundlanders to other provinces in search of work will not occur.

As out-migration may realistically decrease, so, too, in-migration will probably increase beyond the levels outlined in the EIS. The analysis presented in the EIS does not consider the effects that people who come in search of work will have on population growth. Given the traditionally strong ties between Newfoundlanders living in other parts of Canada and their home, and the generally lacklustre growth in job opportunities in Canada, perceived job opportunities in Newfoundland will draw people to the Province in a manner uncharacteristic of past migration patterns.

An increase in in-migration coupled with a decrease in out-migration will substantially change the population

projections. If development other than Hibernia occurs, the effects on population growth will be even greater.

Mobil does recognize that these factors are missing from the analysis. While there is agreement that an exact estimate of these variables would be difficult, analysis of the order of magnitude of population variation is possible and should be undertaken. Some sensitivity analysis should be incorporated into the EIS to show the varying effects on the total population given various levels of in and out-migration. Further, given the high probability that the population estimates will underestimate the true population growth, the impacts of this possible larger population growth should be addressed.

3.2 Impact on Housing

An increase in the demand for housing offers a potential opportunity for the construction industry and for the suppliers of building materials. It is questionable as to whether the EIS has provided sufficient information to allow these groups to fully avail of these opportunities.

The household projections presented in the EIS were estimated using demographic projections, discussed in the previous section, as well as population and household figures from CMHC. An examination of the underlying assumptions points to the tenuous nature of the projections.

First, the projected population estimates are a major determinant of the number of households expected to accompany the development of Hibernia. As was pointed out in Section 3.1 of this report, there is every reason to believe that the actual population will be larger than has been projected. As the population estimates vary from projections, so will the household projections.

Second, the demand for own housing versus rental accommodation in St. John's, for example, was based on the number of single versus family persons. "For this assessment it has been assumed that single persons would seek apartment units and not single detached homes. Families are expected to require houses, and it is assumed that they would be purchased rather than rented." (Pg. 257, Vol. IV)

The problem, however, is that the ratio of single to married persons may vary substantially from the estimates presented in the EIS. Numerous assumptions have been made throughout the analysis regarding the proportion of married to non-married workers, and the proportion of accompanied workers. In Argentina, for example, it is assumed that 20 percent of the workers will be accompanied by their families when data from 12 major construction projects found that the proportion of accompanied workers varied from 23 to 92% (Hibernia Demographic Impacts, pg. 5-30). Probable variations in estimates resulting from such assumptions will create a far different demand for housing versus rental accommodations than has been outlined.

In terms of housing supply, the EIS fails to examine the housing construction industry's ability to deliver the required accommodation in a timely manner. Many believe that the industry could respond adequately to satisfy the demand for owner-occupied, single-family housing, although this position has not been examined to any extent in the EIS. It is not clear however, whether the industry can respond equally efficiently to the demand for rental accommodation. In fact, the City in its planning and zoning activities has eliminated medium density residential, bringing yet another dimension to this problem, the

availability of suitably zoned land. The development of rental housing at a suitable rental rate is not an attractive investment for developers. This trend is not peculiar to St. John's but is a national one. In light of some of these issues, the proponent has failed to examine the supply side of the housing demand/supply equation to determine whether government, the private sector or communities can respond to these needs.

The issue of competition for skills is relevant here as well. If Hibernia is developed utilizing a GBS, then in the initial stages of development there will be a high demand for skilled civil tradesmen such as carpenters. This demand for civil trades could coincide with the demand by housing and other construction placing a premium on the availability of civil trades. Additionally, the higher wages in the offshore will likely attract skilled workers from the traditional construction industry activities. The impact of this increased competition for skills has not been addressed.

Only when such issues have been examined in detail can responsibility for their resolution be assigned, suitable action plans developed and a monitoring mechanism put in place to evaluate industry's and/or government's ability to react in a timely manner.

3.3 Exploration Activity

One assumption underlying the macro-economic base case for Newfoundland, (pg. 228, Vol. IV) implies that most offshore exploration activity has been carried out simply because PIP grants have been available, and their absence will mean drastic reductions in exploration (p. 21 - National and Provincial Macroeconomic Impacts of the Hibernia Development Project - a background study to the EIS carried out by Informetrica Ltd.). There are a number of reasons why exploration by multi-nationals like Mobil may not be reduced drastically and that further developments may occur alongside Hibernia. These include:

- i) PIP grants have been more an incentive to smaller Canadian oil companies rather than to the multi-national companies.
- ii) In view of the lead time necessary for such developments, current world oil prices are not altogether relevant in terms of offshore explorations but rather oil price trends have greater relevancy.
- iii) When and if Mobil begins to develop Hibernia, the knowledge and experience gained will be such as to substantially reduce the risk associated with development in this environment. Mobil, as a result, may be testing the waters before other world oil companies enter into the arena.

This is not to suggest that exploration and

development will increase but, rather, that such a possibility is a realistic assumption and one which should have been considered in the EIS.

3.4 Inflation

While it is safe to accept Mobil's forecast of project related inflation for Canada as a whole (pgs. 221 and 224), it is dangerous to downplay the possibility of price increases within Newfoundland's impact areas. Mobil should have provided a scenario whereby other developments along with increased exploration take place alongside the Hibernia Project. Such a scenario could represent an optimistic view providing a range from the base case. Land and housing prices as well as labour costs might be particularly vulnerable under such a scenario. Ironically, Mobil suggests that long-term planning must be carried out in order to mitigate against inflation. (pg. 231). Surely the inclusion of other offshore activities as part of a sensitivity analysis resulting in a range of impact would be instrumental in focusing the long-term planning exercise.

3.5 Canada Benefits

Section 4.1, Volume IV, of the EIS states as follows:

"This Section assesses the capability of industry in Canada and Newfoundland to supply the goods and services required during the development of Hibernia... The assessment should not be interpreted as a prediction of what will happen. The estimates of potential participation levels

presented in this section must be regarded as generalizations..."

The Company then provides a fairly detailed outline of the potential benefits to Canada and/or Newfoundland as a result of the development of Hibernia. These potential benefits will impact both industry (in the supply of materials, equipment, services and construction activity) and labour (in the fabrication and installation of various components of the facility). There is no doubt that the economic benefit from the development of Hibernia could be substantial. However, there are no real means of determining from the Impact Statement just where, to what degree, and to whom these benefits will accrue.

As noted, the benefits described are generalizations. However, it should also be remembered that these generalizations are based on a set of assumptions or qualifications and this further erodes the credibility of conclusions based on the analysis of the data presented. While it is accepted that in a paper such as this, given the lack of actual design data and the timing, assumptions/qualifications are necessary. They should, however, be realistic and supportable. Certain of those used by Mobil are questionable.

For instance, the entire Statement is built on the theory that Hibernia will be developed in isolation. That is, it will be the only major offshore project which will commence within the stated time period. There is strong evidence to suggest that this is not the case. Development of the Venture gas field off Sable Island may get underway before the Hibernia project. A second development project on

the Grand Banks, beginning in the early 1990's, is also a real possibility. Such a combination would have serious implications for the labour market, industrial investment, municipal services and accommodation which the EIS glosses over rather quickly.

Alternatively, when assessing the investment requirements necessary to participate in offshore development, Canadian suppliers may be reluctant to move in an Hibernia-only scenario. However, a multi-field development would make expansion or establishment of new facilities a feasible option.

Further, and probably more serious from the short-term development standpoint, is the assumption that Canadian/Newfoundland firms will be competitive in the world marketplace. This assumption appears to contradict statements made in Section 4.1.1.1 of the Report as to why Canadian suppliers cannot compete in this market. Briefly, this reasoning centers around experience, capacity, labour costs and subsidization.

Many industrial analysts believe that Canadian yards will not be competitive on the first development. This condition results from learning curve position, lack of training, material premiums, quality assurance, union agreements and the attitude and approach of the offshore industry. Furthermore, there is some evidence to suggest that Canada, based on the facilities used, will be equal to or could exceed the productivity of European yards after the first one or two developments have been completed. Japan and Korea will continue to provide severe competition as they do at present.

There are two potential modes of development for Hibernia. Following a final decision of which mode will be used, layout, equipment and material specifications will be determined in the detailed design. These factors combined with the timing of the project will heavily influence the economic impact. The EIS should provide a clear statement of the procedure for defining the benefits which will accrue to Canada as well as the procedure for ensuring that these benefits are realized. Nothing of this nature has been provided. This statement would include a list of indicators which can be used to monitor the extent to which such benefits are achieved.

With reference to Canada Benefits, Mobil uses such clauses as "will give consideration to..." and "to the extent that it is practical and cost effective..." to preface its dealings with Canadian suppliers. What is most clear is that all works or services related to development will be tendered on the world market and that Canadian suppliers must compete effectively in this market if they are to realize anything from such development. Given Canada's current position with respect to supply in the offshore industry, the results of such competition will not be positive, particularly on the Hibernia project.

The EIS does identify the potential economic return for Canada from Hibernia. What is now necessary is for Mobil to clearly provide the means for achieving and measuring these benefits.

ENVIRONMENT CANADA
REVIEW
OF THE
HIBERNIA DEVELOPMENT PROJECT
AS PRESENTED TO THE
HIBERNIA ENVIRONMENTAL ASSESSMENT PANEL

July 1985

Scientific and Technical
Comments

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1. Introduction

Environment Canada has reviewed the scientific and technical merits of the Hibernia Development Project Environmental Impact Statement. This document summarizes our findings. The Department is prepared to explain or enlarge upon any of the commentary we have provided.

Environment Canada acknowledges the considerable contribution which Mobil Oil Canada Ltd. has made in consolidating the existing knowledge of the Northeast Grand Banks and by sponsoring additional studies in an effort to fill existing data gaps. Continued research and monitoring in this area will add to the data and understanding of the ecological interactions which are occurring and will facilitate management decisions on hydrocarbon exploration and production activities in the Grand Banks region.

There are, however, some significant weaknesses in the impact assessment contained in the Mobil Impact Statement. The following commentary is intended to assist the Panel in identifying these areas and the proponent in addressing them.

A Departmental position on the proposed Hibernia Oil Field Development project will be provided to the Panel subsequent to our evaluation of the information to be provided by Mobil Oil Canada Ltd. in mid-August.

2. Summary

2.1 Overview

Environment Canada recognizes the fact that the Hibernia Development Project Environmental Impact Statement as prepared by Mobil Oil Canada Ltd. is based upon development concepts which have yet to be precisely defined. The proponent has yet to declare its preferred development approach - floating or fixed production systems - and as such, the present Impact Statement remains a planning tool by which the principles and constraints of design may be identified. Environment Canada fully supports consideration of environmental factors at the earliest stages of development planning; it is equally important, however, that environmental criteria are incorporated in the development, construction and ultimate operation of Hibernia. The proponent does not provide a commitment to the principles of best practical technology to protect the environment. Just as there are guiding principles by which an engineering project is designed, so there are environmental principles to which a commitment should be made, even at the earliest stages of project design.

This Department considers that the proponent is overly optimistic in the evaluation of environmental risks inherent to this development. In presenting qualitative narratives of the ecosystems and incomplete evaluations of, for example, the environmental risk from oil spills and potential seabird mortalities, the proponent has not provided the Panel or the public with an accurate understanding of the risks and benefits of the Hibernia Development Project.

Although the department does not have the expertise to dispute the proponent's claim that a structure can be built to operate on the Grand Banks in an environmentally safe manner, the proponent has not adequately supported its claim by providing evidence of a thorough engineering risk analysis or its equivalent. The environmental conditions on the Grand Banks are extreme and a number of the engineering aspects of this project, for example, the potential for iceberg collision and bottom scouring, are unprecedented. Neither the analysis of the data base nor the means by which impacts are evaluated are adequate to provide a comprehensive understanding of the risk posed by the environment to this development.

The boundaries utilized in the Impact Statement are artificial and inconsistently addressed. For example, the potential for shoreline or coastal impacts should be considered and significant ecological features such as Flemish Cap and the Southeast Shoals are noted but not included when impacts are evaluated. As well, the cumulative effects from developments ancilliary to Hibernia or from other concurrent uses of the Grand Banks are not addressed.

Regardless of its limitations as a predictive or planning tool, the Impact Statement and the background documents used to produce it represent a significant compilation of information on the Grand Banks ecosystem. As a descriptive work, the Impact Statement will be widely utilized as a reference and, therefore, should be factually accurate. We have identified a number of corrections in our commentary and we urge the Panel to require the proponent to issue a corrigendum.

2.2 Marine Birds

The Grand Banks can be considered the ornithological crossroads of the Northwest Atlantic, and human induced changes in the marine environment

place entire populations of birds at risk. It is Environment Canada's judgement that oil losses from this development will lead to significant mortalities in certain seabird species and could result in irreversible impacts on some populations. This could affect birds which breed in Newfoundland, as well as immigrant species which range from the high Arctic to the South Atlantic Ocean. The proponent has not fully evaluated the potential impact on seabird populations, even though it is stated that the risk to individual animals is high. Since seabird mortality following an oil spill bears no predictable relationship to the amount of oil spilled, Environment Canada is as concerned with the incidence of small chronic oil releases as with the occurrence of a large accidental oil spill. The proponent should be required to more fully evaluate the risk to seabird populations and propose mitigative measures to reduce or eliminate the loss of even small quantities of oil.

2.3 Meteorological and Oceanographic Criteria

The Department considers that the proponent's ability to mitigate iceberg collision through early detection and avoidance has been overstated. Remote detection of icebergs is still very much in the developmental stage. Although the Impact Statement presents relatively comprehensive and up-to-date meteorological and oceanographic data, the data are not always interpreted appropriately. If not corrected in the early stages of project design, this may lead to invalid design criteria with respect to wave height or ice accretion, for example.

2.4 Oil Spills

Environment Canada considers the treatment of oil spill prevention, fate and mitigation to be incomplete even though the slick trajectory models employed are state-of-the-art. In addition to the evaluation of the impact of a major oil spill at the well site, the proponent should determine the impacts of spills from a tanker carrying Hibernia crude along existing traffic lanes. Furthermore, the properties of Hibernia crude and its tendency to form dense persistent emulsions with cold

seawater should be factored into the predictions of slick fate and effects to more accurately reflect likely conditions. Effective oil spill clean-up technology has not been demonstrated under open ocean conditions. The potential for and feasibility of such oil spill clean-up, as well as alternative approaches to mitigation should be investigated. The proponent should provide more analysis of movement of oil in pack ice and below the water surface. In addition, the potential for a blowout, a large accidental oil spill and smaller spills during oil transfer has not been inadequately addressed.

2.5 Environmental Effects of Oil

The Impact Statement has not dealt adequately with the possible effects on the marine ecosystem of either major oil spills or chronic releases of oil. Environment Canada considers that the Impact Statement presents an overly optimistic picture of the environmental effects resulting from a major oil spill. In addition, long term impacts, such as a build-up of contamination around production wells and ancilliary offshore fields, have not been addressed by the proponent. The question of cumulative impacts of all present and potential uses of the coastal environment is not adequately addressed. Additional justification is therefore required to support the statements that oil spill impacts will be "negligible" or have "no impact". The argument that the Grand Banks is a homogeneous mass which will quickly replace any biological component destroyed or damaged by oil pollution is disputed by Environment Canada.

2.6 Risk Analysis

No risk analysis has been presented by the proponent. Although the proponent has made a commitment to perform an engineering risk analysis on some part of the project at an unspecified future date, there has been no commitment to conduct an environmental risk analysis. Both types would form a rational basis for comparison of the development production alternatives and it is the opinion of this Department that this or some other form of quantitative comparison should be provided as a basis for the proponent's decision on the production method of choice.

2.7 Operational Discharges and Controls

Environment Canada does not agree with the proponent's plan for managing oily water discharge. Reasonable estimates of the frequency of upset conditions which could significantly increase the total quantity of oil discharged have not been presented. The proponent should therefore be required to provide these estimates and should investigate the feasibility of more appropriate methods of controlling discharges under routine and upset conditions.

2.8 Monitoring

The lack of a detailed monitoring plan of predicted impacts and a strategy for detecting other impacts is a major deficiency of the Impact Statement. To effectively mitigate unpredicted impacts, a comprehensive monitoring program is essential. A commitment by the proponent to evaluate various monitoring mechanisms and implement a suitable approach at project start-up is needed at this stage of the proponent's planning process.

2.9 Socio-economic Analysis

The proponent has underestimated the full spectrum of socio-economic impacts and consequently the environmental impacts such as the land and resource use from the Hibernia project. As a result, discussion on the management of impacts has not fully considered the range of mitigative measures that may be required.

3. Subject Reviews

3.1 Marine Birds

Environment Canada considers that the sections of the Impact Statement dealing with seabirds do not fully evaluate the potential impact on seabird populations. Chronic oil spills have not been evaluated nor has the proponent integrated seabird distributions with spill trajectories.

3.1.1 The Grand Banks seabird community

The Grand Banks may be thought of as an ornithological crossroads in the north-west Atlantic, and human-induced changes in its marine environment may affect populations of seabirds which breed far away from Newfoundland. Canada has international obligations to protect these species under the Migratory Birds Convention.

The Impact Statement correctly notes that many of the seabird species visiting the Grand Banks migrate from distant breeding places. However, the significance of this warrants particular emphasis in a general summary, instead of being discussed piecemeal in the individual species accounts. For example, the world population of Greater Shearwaters from the South Atlantic winters on the Grand Banks, as does the Dovekie population of north-west Greenland, the principal breeding area for that species. Banding and taxonomic studies demonstrate that significant numbers of Northern Fulmars fly from western Europe and the European Arctic. Most of the juvenile Atlantic Puffins from south-west Iceland (the world population centre for the species), Thick-billed Murres from west Greenland and the eastern Canadian Arctic, Black-legged Kittiwakes from there and from Britain and the European arctic, Cory's Shearwaters from the Azores, Sooty Shearwaters from the Falklands and Wilson's Storm-petrels from Antarctica all make their way to the Grand Banks. These aspects should be addressed in the Impact Statement.

3.1.2 The risk of inshore oil spills

Statements such as ". . . the movement of oil towards the coast of Newfoundland is very unlikely because of the prevailing westerly winds . . ." (I: 46) take no account of possible spillages away from the Hibernia field. Tuck (1961) has shown as long ago as the 1950's that dead birds, apparently oiled by chronic minor leaks from passing ships, were common along the south east coast of Newfoundland. Presumably the shuttle tankers (Section 3.2.4) will pass through this area en route to refineries in eastern Canada and the U. S. The Impact Statement merely states that tankers "would use existing shipping lanes when transporting the oil from the Hibernia field to the shore" (II: 23); this is too vague a description for planning or environmental assessment. Accidental spillages, tank and bilge washing, etc. associated with the construction phase of the project at Come-by-Chance or Argientia, are also a possible source of chronic spills. The species most at risk here, to judge from the distribution maps, and the investigations which followed the "Irving Whale" spill in 1970 would be the very large flocks of shearwaters which feed inshore in early summer, the seabirds breeding at Cape St. Mary's, and wintering eiders, oldsquaw and black guillemots. An estimate of risk to these species should be developed and the proponent's proposed mitigation should be detailed prior to project approval.

Diving birds such as the common Atlantic puffin, Razorbill and Northern Gannet are the most vulnerable species to oil pollution, as are birds in the waters adjacent to major breeding colonies and offshore in feeding areas when the birds are locally concentrated. Major seabird colonies at risk are Baccalieu Island, the Witless Bay Seabird Sanctuary comprised of Gull, Green and Great Islands and Cape St. Mary's Sanctuary. Other than direct oiling of adult and non-breeding birds, serious reproduction losses are possible even though spills may be 40 to 60 miles from the colonies. These losses can occur by transfer of oil to eggs by incubating birds, ingestion of contaminated prey species by chicks or

reduced provision of food to chicks from oil-impaired adults. Contingency plans in the case of an oil spill affecting these areas should be outlined in detail; estimates of risk, implications of losses and mitigation should be detailed.

3.1.3 The 'zonation' of seabird distributions off eastern Newfoundland

It would have been more relevant for planning purposes, and highly pertinent to this Impact Statement, if the authors had abandoned these zonations altogether and used operational criteria instead. Table 3.2-23 could have shown, for each seabird species, the probability of its occurrence - in spring, summer, fall and winter - a) at the outer edge of the Grand Banks, adjacent to Hibernia, in the area of predicted slick-drift (Figures 4.7-7/-8/-9); and b) in Placentia Bay and its outer approaches, adjacent to whatever activities are planned for Come-by-Chance and/or Argientia. The Sensitivity Indices from IIIa, Appendix B: Table B-4, properly defined (see below), could have been added for good measure, and would have provided a practical "planning tool". **Seabird distribution should be integrated with spill trajectories to more thoroughly evaluate the impact on seabird populations.**

The oversimplified system of "zones" is unacceptable in this section because the proponent has missed the opportunity to add a predictive dimension to its summary of facts. Ivory gulls, for example, are not so much "offshore" as ice-associated birds; they are actually coastal in northern Newfoundland, where the pack-ice comes close to land. The distribution of winter pack-ice, shown by satellite imagery, should allow a fairly good prediction of the distribution of ivory gulls. A comparable prediction of shearwater distributions in the spring could be made from fisheries data on the distribution of capelin, an important prey. Prediction of the distributions of dovekies and auks, notoriously vulnerable to oil spills, is even more to the point. They depend on local concentrations of zooplankton, close to the surface, for economical foraging (c f. Brown, 1980). Figure 3.2-28 and earlier sections of Vol. IIIa show

that dovekies and zooplankton are sometimes locally abundant at the eastern edge of the Grand Banks; also that oceanographic frontal systems, such as are known to concentrate zooplankton, occur there as well. Satellite imagery can show the position and intensity of fronts, and could be used to predict dovekie distributions - verifiable through aerial surveys - in the event of an oil spill from the Hibernia field. This, too, would be a valuable "planning tool". **We, therefore, recommend that a revised evaluation be developed in collaboration with Environment Canada which will include a predictive dimension.**

The value of Section 3.2.7 (Vol. IIIa) is greatly diminished by the fact that the distribution maps (Figs. 3.2-33/-37, Vol. IIIa) use a single symbol to cover the range of densities from '0 - 5 birds/km'. It is an elementary requirement of any distribution map that the **absence of a species must be clearly distinguished from its presence, even at very low densities.** A casual reader might well assume that the blank areas on the maps indicate an absence of birds, whereas they probably (the point is not clear) only indicate an absence of census coverage.

Table 3.2-23, and the text summaries in Section 3.2.7, are very hard to assess because, there is no definition of the "coastal", "nearshore" or "offshore" zonation, the basic background against which the species' distributions are discussed. For example, Table 3.2-23 states that the northern fulmar is "offshore, coastal", but in fact it is unusual to see the species close to land in the survey area, as Figure 3.2-33 confirms. The same applied to dovekies, unless the "coastal" boundary is extended unrealistically far out to the inner edge of the Grand Banks. Common and arctic terns occur "offshore" only during spring and fall migration; they are otherwise highly "coastal". Iceland, herring, glaucous and great black-backed gulls are "nearshore" rather than "offshore" in the survey area: they are normally scarce on the outer edge of the Grand Bank (Brown et al., 1975).

3.1.4 Use of Existing Information on Newfoundland Seabirds

The literature cited as the basis for the species accounts (IIIa: section 3.2.7) has some significant omissions: the two waterfowl volumes of 'The Handbook of Northern American Birds', for example, the three published volumes of 'The Handbook of Birds of Europe and the Western Palaearctic', and even Peters and Burleigh's 'The Birds of Newfoundland'. This has led to oversimplifications such as 'razorbills are rare in the study area in winter' (IIIa: 202), an unsupportable statement which seems to imply that they may therefore be ignored. Reference to Lloyd's (1976) review of the world population of the species would have shown that it is the rarest colonial auk in the Atlantic and should be protected - a relevant point in the present context. It is true that most of the North American population breeds in Labrador, but a search through the papers on winter oil-kills reviewed by Brown (1982) would have shown that it winters off New England. It is a fair deduction, supported by banding data, that at least part of this population migrates twice a year through the area covered by the Impact Statement. The fact that razorbills are seldom recorded, reflects nothing more than the difficulty of distinguishing them from the much more numerous murres.

The Impact Statement also omits pertinent information from some of the references which it cites. For example, it is clear from Tuck's (1961) analyses of winter oil kills in south-east Newfoundland, and from CWS Progress Notes on the Newfoundland "turr" hunt (Wendt and Cooch, 1981; Gaston et al., 1983), that the waters off the east coast of Newfoundland are a major wintering area only for thick-billed, not common murres (IIIa: 200); Gaston's (1980) quantitative distribution of these birds into High Arctic, Low Arctic and west Greenland components is at least as relevant for impact assessment as his overall estimate of the size of the population. The Impact Statement cites Tuck's (1961) hypothesis of a northerly post-breeding dispersal of Newfoundland common murres, safely away from the Hibernia area, without noting its principal flaw: there is virtually no chance that a banded bird could be recovered to the east, away from the coastline. It also omits the point, clearly stated by Tuck (1961), that this is a **swimming** migration, and that a year-class of chicks and half

their parents might be put at risk by an oil spill at this season. **It is recommended that the Impact Statement address these matters.**

3.1.5 Effects of oil on seabirds

The effects of oil on seabirds are discussed only in a general way, and the summary on page 83 of Vol. IIIb is confused. **The principal effect is in fact external;** the ingestion of oil causes long-term, sublethal effects, but is less important in the context of the adult. It would be more accurate to say that "the increased weight of the wetted plumage hinders swimming, flying and diving and, as an added consequence, increases energy requirements." "Drowning" is an unlikely cause of death - if, indeed, it has ever been recorded: oiled birds eventually sink to the bottom, but probably only after they are dead. "Hypothermia" and "exhaustion" are not alternatives, but part of the same syndrome: the birds lose heat, mobilize their energy reserves to replace it, and die when these are exhausted.

This section should have described the actual cases-histories of seabird and waterfowl mortalities caused by oil spills off Newfoundland and elsewhere in Atlantic Canada. The omission is unexplainable because the Impact Statement cites several references (e. g. Tuck, 1961; Brown, 1982) from which this information may be obtained. Citation of these historical data would have provided the Impact Statement with a useful "planning tool", illustrating among much else, based on the results of the "Arrow" and "Irving Whale" oil spill incidents, **the bird mortality following an oil spill bears no predictable relationship to the amount of oil spilled.**

This undermines the basic assumption, implicit throughout the Impact Statement (e. g. IIIb: 69), that any consequence of oil spills which may occur in the course of the proposed operations will at worst be minor, and therefore of little consequence in terms of seabird and waterfowl mortality.

3.1.6 Cumulative Mortality

It would also have been useful if the Impact Statement had considered seabird mortalities due to oil in the context of all the other, human-induced mortalities to which the birds are subjected, that is, the cumulative effects. Salomonsen (1967) describes the disastrous effects of overhunting on the west Greenland population of thick-billed murres. The estimated annual kill of 250,000-500,000 birds in the Newfoundland "turr" hunt (IV: 123) is of the same order of magnitude. The drownings of large numbers of murres and other auks in gill-nets, both in Newfoundland and Greenland, is also well-documented. These are serious losses for species whose reproductive strategies are geared to low annual mortalities due to "natural" causes. It is relevant to ask whether the populations can absorb additional mortality due to oil. A statement such as "a few organisms will undoubtedly be disrupted or killed . . . but this disruption does not appear to be at the population level" (IIIb: 104), if intended to apply to seabirds, is simplistic and **not** an acceptable answer. The Impact Statement provides generalized summaries such as the paragraph "Seabirds are the group most sensitive to oil spills . . . dependent on time of year, type of spill, and direction of movement of oil" (IIIb: 83), which is too vague to be of practical use. The vulnerabilities of the various species should be spelled out, if only in such simple terms as: "analyses of previous oil kills show that diving birds (auks, loons, grebes and diving ducks) are the most vulnerable groups; gulls and dabbling ducks are relatively unaffected. The behavior of shearwaters and phalaropes at sea would put them at risk, though no actual instances have been reported." It is true that the species are ranked according to a Sensitivity Index in IIIa, Appendix B: Table B-4, but it is not acceptable to find no explanation or justification for this index.

3.1.7 Disturbance from Helicopter and Light Aircraft

The operation of helicopters and light aircraft is likely to cause serious disturbance to seabirds at the landward end of their routes, not in the Hibernia area. This point should have been made in, for example, IIIb: 95. Flight paths must avoid the exclusion zones around seabird colonies,

as described by Nettleship (1980). There must be compliance monitoring and strict enforcement to prevent joy-ride visits by industry helicopters and light aircraft to the colonies at Cape St. Mary's, Witless Bay and elsewhere. Such overflights have already caused significant disturbance at Witless Bay, as well as at Arctic colonies.

3.2 Meteorological and Oceanographic Criteria

3.2.1 Data Base Interpretation

Meteorological and oceanographic factors have a significant effect on the safety, design, construction, and operation of project facilities. Although the EIS presents a relatively complete data set, the analysis and interpretation of these data are deficient. **A more thorough analysis is required to ensure adequate design criteria with respect to wave height or ice accretion.**

Data from St. John's Airport, Marine Statistics System (MAST), and drilling platforms are used to represent the climatology of the project area. There is no discussion of the apparent discrepancies which exist between different data sources, or resulting from the amalgamation of statistics based on significantly different periods of records, or the adaptation of land-based data for the offshore.

Other examples where the interpretation is weak or misleading are in V 111a: 26, 3.1.1, P2 and V 111a: 28, 3.1.1, Table 3.1-4. Both the Evans-Hamilton Inc (1981) and the Ocean Weather Inc (1982) values are derived from sample wind speeds occurring in the maximum wave-producing storms, not the overall maximum wind speeds. Other data sets use the overall maximum winds. Comparisons are made but there is no discussion of the differences between the samples.

3.2.2 Ice and Icebergs

Environment Canada disputes the proponent's claims regarding the use of remote sensors for iceberg detection. Under conditions of poor visibility and high sea states, bergy-bits, growlers and/or ice floes are not detectable with high confidence using present-day remote sensing techniques.

Furthermore, the proponent's method of determining the "maximum" kinetic energy for icebergs is unclear. No maximum velocity is given for icebergs except to say they can exceed 1.4 m/s in general (V 11:28, P4, L22), or 0.6 m/s for the Hibernia area, in particular. **This is extremely important in relation to the development of design criteria for a Gravity-based Structure (GBS).**

It is stated by the proponent that the edge of sea ice on the Grand Banks can advance westward at a rate of more than 50 km per day under certain conditions (Vol 3A p69). This implies a potential for sea ice from the Hibernia area to approach the Avalon Peninsula Coast somewhat faster (approximately 6 days) than mentioned earlier in the report (10 to 20 days). It is agreed, however, that ideal sustained conditions for this period of time would be unusual.

The statement, "As pack ice drifts southward from the Strait of Belle Isle along Labrador and onto the northern Grand Banks...", (Vol. 3A p71) does not describe the typical sequence of events. It is more unusual to observe pack ice drifting southward along the Labrador Coast toward the Strait of Belle Isle and the northern Grand Banks areas.

It is stated that sea ice of this region is highly deformed and that ice ridge heights have been estimated up to 4.5m. However, the report dismisses the likelihood of an associated ice keel having a draft of 14 metres on the basis of melting due to drifting over warm water. Assuming uniform melting of the underside of the ice floe, the ridge structure would survive and the thinnest ice would disappear first. Also, if floating ice is to obey hydrostatic equilibrium and the 1:3 ridge height to keel depth ratio is applied, a keel depth of 14 metres is not unreasonable. Furthermore, it is quite feasible that the "old surface feature" described (Vol. 3A, p. 71) was in fact the feature of an old (multiyear) ice floe originating from further north.

The likely severity of sea ice and iceberg impacts on the development should be carefully re-evaluated by the proponent.

3.2.3 Wind

The proponent's method of analyzing the wind data is a major concern. The values quoted for design winds (V II: 27, Table 3.3.1) are lower than Environment Canada would judge to be true based on observations from the general area. One reason for this discrepancy appears briefly in the footnote to this table -- "the winds which were used as a sample for the extremes were selected from those which occur simultaneously with maximum wave height." The only true estimate of design wind in table 3.3-4 is that provided by Swail and Saulesleja (1981) who estimate the 100 year wind to be 116 knots. Extremes of wind speed, independent of wave heights, should be provided in the Impact Statement either instead of or in addition to the values given.

The maximum wind speeds from the MAST data are apt to have a fair weather bias resulting in the highest value predicted in 100 years being lower than that which could actually occur. The Evans-Hamilton Inc (1981) data are certainly too low, since the wind speed sample used came from the sample of the largest wave-producing storms. According to the East Coast Storm Catalogue, storms occurred on February 14, 1982, with winds of 91 knots and on December 25, 1983, with speeds in excess of 100 knots; both as measured from ships. Although these winds were recorded outside the Hibernia area, such storms are similar to those that traverse the Hibernia area.

3.2.4 Sea Spray and Atmospheric Icing

The Impact Statement acknowledges the need for further investigation of icing design criteria (V II: 27, footnote 2; and V II: 29, 3.3.2.2, Pl) and Environment Canada agrees that the ice accretion potential for design purposes should be investigated more thoroughly. The Impact Statement gives an extreme ice accretion rate of 12.5 mm/hr for the project structures (Vol. II: 27, Table 3.3-1). However, based on recorded observations from the project area and using widely accepted relationships

of meteorological parameters to accretion rates (e.g. Merton, Sawada, KGS), it is the opinion of this Department that extreme accretion rates caused by sea spray would be significantly greater than 12.5 mm/hr. Accretion rates could be increased further by freezing precipitation at or near the time of significant accretion from sea spray. **This ice buildup may affect the stability of floating facilities and vessels associated with the project.** The Sedneath incident on the Scotian Shelf on February 25, 1970 is a case in point. It is our understanding that ice accretion rates were very high causing problems with draft and stability of the rig. Environmental conditions at the time were 50 mph winds, 15 foot seas, 10 to 12 foot swells, freezing rain and freezing spray.

In addition, the proponent's assessment of aircraft icing is not adequate. There is no discussion of aircraft icing problems that may be encountered after the aircraft is enroute.

3.2.5 Environmental Information and Forecasting Services

The document provides no details on the provision of real-time weather and environmental information and forecasting services, except to indicate that observational data transmission and forecast functions may be carried out in the same way as during the exploration phase and would involve an amalgamation of Departmental and private sector activities. **The Impact Statement should provide specific information on how the proponent envisages that these will be provided (e.g. elements observed/forecast, observation and forecast issue times, frequency and period of forecasts, criteria for issuing revisions, amendments and warnings, responsibility centre for each function, etc.).**

3.3 Oil Spills

Environment Canada considers the treatment of oil spills prevention, fate and mitigation to be incomplete. The value and acceptability of an impact analysis can be judged as much by what is omitted as by what is included. Many important findings identified in the background documentation prepared for the proponent have not been presented in this Impact Statement or have been downplayed.

The impact statement attempts to reduce impact ratings to "minor" or "negligible" based on available containment and clean-up measures and yet such measures are largely ineffective. Spill prevention will, therefore, be of paramount importance. Regulatory agencies must be given adequate opportunity to review and influence the final development and contingency plans.

3.3.1 Spill Trajectories and Slick Fate

The slick trajectory models employed are state-of-the-art and the procedures employed are considered acceptable, however, a number of significant concerns remain relative to the assumptions that are made, the input data, and the conclusions that are drawn from the analyses.

The proponent has chosen to limit modelling of major spills to the immediate Hibernia area; this is considered inappropriate since the potential impact of the project on the wildlife and fish resource cannot be adequately evaluated unless the risk of spills from shuttle tankers are also taken into account. Recognizing that tanker destinations are uncertain at this time, the proponent should, as a minimum, develop spill trajectories for the points where the shuttle tankers merge with major shipping lanes

approximately 46°30'N, 52°20'W and 45°N, 50°15'W). It should also be noted that Figure 4.5-1 in Volume III(b) simplifies the original map as referenced in Canadian Coast Guard (1981) and in the process excludes a heavily travelled shipping lane which crosses one of the two proposed tanker routes at about 45°30'N, 50°W. **A tanker spill scenario emanating from this area should also be provided by the proponent.** In order to illustrate our concern, Environment Canada commissioned an analysis of a worst case batch spill from 46°30'N, 52°20'W, employing the same model and input data as used by the proponent to assess spills at Hibernia. The results of this simulation are attached (see Appendix). These worst case scenarios suggest that oil may come ashore in any of the four months selected (i.e. January, April, July and September). Up to 31% of the oil spilled could impact Newfoundland shorelines within thirty hours.

The modelling (Ross 1984) that has been provided in the Impact Statement is based on an assumption that no emulsification occurs; nowhere is this fact clearly stated in the Impact Statement. This is of particular concern since Hibernia crude readily forms stable emulsions, which significantly increase the volume of the slick, and the time required for it to dissipate. In the Impact Statement, impact predictions are based on a "typical" crude at sea.

The emulsification process leads to a five to ten times increase in the original oil volume and a slick thicknesses at least five times those predicted (Ross, 1984). Emulsified oil spreads, disperses and evaporates at very different rates than crude oil that is not emulsified.

An addendum to the Ross (1984) background document indicates the blended Hibernia crude is waxier than originally thought. It does not appear that this has been reflected in the slick trajectories which appear in the Impact Statement as Figures 4.7-8 and 4.7-9 in Volume III(b). **The proponent should clarify the properties of the crude and identify those used in the modelling exercise.** In order for the modelling and slick trajectories to realistically simulate the probable oil movement in the case of a spill, **emulsification phenomena must be factored into the simulations.**

Some attempt should have been made by the proponents to model and predict the movement, distribution and impact of oil which may travel below the water surface.

It is informative to consider the predicted area of coverage after five days for the various spill scenarios (Ross, 1984) since this gives a better perspective on the problem facing sea birds and other wildlife than is available in Table 4.7-1 and Figures 4.7-1, 4.7-2 and 4.7-3 of Volume III(b). After only five days, the worst case subsea blowout is anticipated to cover a 2,400 km² area, the worst case platform blowout an area of 1,650 km² and the worst case batch spill roughly 500 km². These are the areas actually covered by the oil slick, according to Ross (1984), and not the broader area contaminated by rogue oil slicks which will have broken away from the main slick. **This type of information should be included in the Impact Statement along with environmental implications and remedial measures planned.**

While it is not indicated in the text, Figure 4.7-6 shows that 60% of the oil remains after forty days from a large batch spill in summer, a time when sea birds are most vulnerable in the study area (c f. Marine Birds, Section 3.1). Although the spill trajectories show a high probability of impacts to areas such as Southeast Shoals and Flemish Cap, there is no discussion of specific resources at risk in these biologically rich areas. Furthermore, comparison of spill trajectories with salmon over-wintering distributions east of Grand Banks, and spring migration routes S. E. of Hibernia, suggest more of a coincidence than the text implies; this is especially true for worst case surface blowouts and a worst case batch spill in summer. Spring trajectories (a time when salmon are concentrated in the area) should be provided to show whether this area is more or less susceptible at that time of year.

The proponent has attempted to discuss dispersion and evaporation phenomena separately. **An attempt should be made to provide an overall oil budget and more consideration should be given to the fate of oil residues**

such as tar balls and viscous mats. It is not adequate to state that the oil either evaporates or is eaten by bacteria.

Potential for oil-ice interactions and the effect that this may have on the oil movement predictions is dismissed without adequate discussion as are the oil-ice-biota interactions. The importance of ice intrusions into the Hibernia area is downplayed and its implications not adequately considered.

It is assumed by the proponent that because oil is not likely to reach shore, there are no significant environmental impacts anticipated (see Volume II, Sec. 11.6.4 for an example of this assumption). The large volume of water overlying the Grand Banks is also used as a reason for not developing appropriate mitigative measures for handling many forms of liquid and solid wastes and for spills (see Section 3.4, 3.5, 3.6, 3.7). Environment Canada does not accept this argument or the principle of dilution upon which it is based.

3.3.2 Oil Properties

The apparent differences between the properties of the oils from the Hibernia and Avalon reservoirs and the effect these have on the fate and behavior of a spill are not mentioned in the Impact Statement. It is also not clear from the Impact Statement at what point the two oils are co-mingled to produce the blend oil called Hibernia crude. It is, therefore, not possible to determine whether there is a significant potential for spillage of pure Hibernia or Avalon oil. According to Ross (1984), both oils display unusually slow weathering characteristics related to their high pour points; evaporative losses are very small compared to other crudes, especially at ambient temperatures on the Grand Banks. Ross (1984) concludes that both oils would tend to remain fresh for unusually long periods of time when spilled at sea. It has also been demonstrated that the blended Hibernia crude also retains many of these properties. Fresh, unweathered oil from the Hibernia field is relatively waxy and has a

high pour point. When spilled, it tends to become viscous under most ambient conditions, especially after some weathering, and rapidly forms oil-in-water emulsions which are also highly viscous (they are in fact more viscous than bunker C at cold temperatures according to Ross (1984)). These emulsions will not spread on water and are very resistant to natural dispersion when thick. The summary and elsewhere throughout the Impact Statement (for example, Volume III(b), Sec. 4.1.3.1) assumes that the Hibernia oil behaves like other crudes and will disperse rapidly. In many cases, the impact predictions are heavily predicated on this assumption, however, it is evident from the preceeding discussion that this is unlikely to be the case. **Impact predictions should be reworked to incorporate the specific behaviour and characteristics of the Hibernia oils.**

The fate and effects of subsurface/near surface oil should be evaluated by the proponents. Volume III(b), Sec. 4.7.1.5 indicates that emulsification will lead to bulk densities as high as $1,010 \text{ kg/m}^3$ which approaches that of seawater (i. e., $1,025 \text{ kg/m}^3$) and yet no mention is made of the possibility of oil sinking and moving below the surface. Ross (1984) states that due to the very low buoyancy of emulsions of Hibernia oil, it may exist as mats floating below the surface, rather than as a coherent surface slick. This phenomenon is particularly prevalent where surface waters have a low salinity due to melting ice.

The fact that Hibernia oil readily emulsifies in rough seas is used to imply that it will not have much effect on marine resources such as sea birds (vol. III(b), Sec. 5.3). Evidence to support this claim should be provided.

3.3.3 Frequency of Oil Spills

The proponent has not presented an adequate assessment of oil spill risks from ship and iceberg collisions, blowouts, transfer operations and pipeline leaks. They should state how many of each type of potential accident or spill are likely to occur and estimate impacts over

the life of the project supported by historical, published and company data. **This analysis should be presented for review.**

The probability of spills in the North Sea is given as 1 m³ per million m³ of crude produced. However, in reviewing the source document (Ross, 1984), the basis of this figure is unclear. The information is derived from a review of 1964-1980 data yet production did not commence in the North Sea until 1975. The average given for the remaining four years of the study period is 13.5 m³ per million m³ produced. The much lower value employed in the Impact Statement is derived by deleting the 1977 spill rate (i. e., 44 m³ million m³ produced) since it was considered anomalous. The value given in the Impact Statement, which is, we consider, still an underestimate, is therefore based on only three years of data.

Historical records from the North Sea and Gulf of Mexico show an increasing accident/spill trend for a number of years after an area moves into the production phase; this phenomenon is likely to also be observed at Hibernia and should be addressed in terms of its significance on the Grand Banks.

Canadian east coast statistics could and should be used for comparison purpose wherever possible. For example, in Vol. III(b), Sec. 4.7.12 reference should be made to the sinking of the 'OCEAN RANGER', two serious well control problems, and two helicopter ditchings during the drilling of roughly 200 exploratory wells. As well, there have been two incidents of ships in danger of colliding with drill rigs and numerous incidents of rigs moving from the path of icebergs and sea ice. The Canada Oil and Gas Lands Administration or the Canadian Coast Guard should be consulted for details of these relevant incidents. East coast accident statistics should also be included in Sec. 11.1 of Vol. 11. Environmental, geological, regulatory and other factors lead to differences in the frequency and severity of accidents between the Gulf of Mexico, North Sea and Canadian east coast; where available, this basis for comparison should be used in the process of developing appropriate prevention and contingency plans.

Worst case blowout spill scenarios are based on maximum completion time for a relief well of ninety days (refer to Vol. II, Sec. 4.4 and Vol. III(b), Sec. 4.7.1.1). In fact, the 90-day figure is the **normal** expected completion time for a relief well of this depth; it is not a maximum. The IXTOC well took 295 days to control after several failed relief wells and more recently, and closer to home, the West Venture well off Sable Island required two relief well attempts and nine months to control. Completion of a relief well in this case was not required. **The potential effect that storms and sea ice/iceberg intrusions into the Hibernia area may have on the time required to drill a relief well should be discussed in the Impact Statement.**

3.3.4 Operational Spills

Mobil plans to install several kilometers of infield pipeline to move crude from satellite wells to the production platform. The Impact Statement suggests that these lines will be laid along the ocean floor and will not be buried or trenched to protect from iceberg scour. The rationale for this is that remote controlled valves and pressure sensitive valves may be installed to automatically shut down a flowline in the event of a major leak.

These infield pipelines probably pose a greater risk of a large spill in the Hibernia area than any other source. An iceberg moving through the area and barely scouring the surface could rupture several of these lines, not just a single line. Pipeline trenching could substantially reduce the risk of iceberg rupture. **The proponent should provide an evaluation of the value of pipeline burial.**

There is a general lack of attention to spills during product transfer which account for 80% of North Sea oil spills by volume; we also believe pipeline spills should also be addressed more specifically in Vol. III(b), Sec. 4.7.1.2. The maximum oil spill volume from subsea pipelines is given as 300 m³ (Vol. II, Sec. 4.4) and yet the average flow rate given for the export line is stated as 9,000m³/hr in Table 3.2-1 of the same Impact Statement. Do the proponents assume that shut-off valves immediately

close when a break in the line occurs? What is the risk of a valve activating incompletely or not at all?

More reference should be made to Mobil's own experiences at its production facilities in the North Sea with respect to chronic leaks and loading leaks especially in Vol. III(b), Sec. 4.3.

Fuel handling and storage facilities and practices for land-based operations as described, for example, in Sec. 4.8 of Vol. III(b) should be designed to minimize risk of accidental spills and to control and contain any spills that do occur.

3.3.5 Oil Transport

The guidelines, both Federal and Provincial, issued to the proponent for the Hibernia project required transportation systems to be considered. The study area defined by the proponent, however, excludes transportation routes (Vol. III(a), Sec. 1.2 and Vol. III(b), Sec. 4.1.3.1) and associated spills or prevention measures. The Impact Statement does not, for example, provide estimates on the frequency of supply and other vessel movements related to the project (some data on existing supply vessel

movements are presented, but little on future movements). There is no quantitative information on existing merchant traffic or incidences of intersecting traffic and fishing vessel traffic. Documentation of navigational hazards, such as the Virgin Rocks which lie directly between Hibernia and the junction of shuttle tanker traffic and shipping lanes south of the Avalon Peninsula, should be provided as should the impact on Hibernia vessel traffic. **The basis used for initial route selection and alternatives should also be provided since it is unclear what criteria were used.**

As noted above, information on vessel traffic is scattered throughout the Impact Statement (Vol. III(b), Sec. 4.5 and 4.8.4, Vol. IV, Sec. 4.6.4.1, 4.8 and 4.8.3.8). **There should be one consolidated section highlighting vessel movements.**

There is no attempt to quantify vessel accident risks; this is required if the risks to renewable resources are to be adequately addressed. The frequency of shuttle tanker round trips and the destinations have a bearing on ship collision risks and on areas that would have to be considered as potentially suffering impacts from a shuttle tanker accident.

There is repeated reference to the fact that shuttle tankers and other Hibernia project vessels will have state-of-the-art navigational aids to prevent collisions with the storage vessel, 'ALPS' and/or the 'GBS'. However, the potential for a collision from another less well equipped Canadian or foreign flag vessel is not considered. Several near misses involving rigs have been recorded off the east coast in the last few years. **The risk of collision between vessels and with the platform should be determined.**

In designing shuttle tankers and other vessels for servicing the Hibernia field, efforts should be made to provide oily water separators on board to clean bilge water and thus reduce routine oil discharges to the Grand Banks. Alternately bilge should be treated by bilge cleaning facilities at point of departure or arrival. **Any increase in oil in water on the Grand Banks is undesirable.** Even a four to six per cent increase

in volume may prove significant to marine birds already under stress from existing levels.

3.3.6 Contingency Planning and Oil Spill Countermeasures

Reference is made in a number of sections, for example, 3.8 and 6.3 of Vol. II, to the fact that manuals, training and other features of the project will prevent accidents and spills; it is important to note that these have been in place throughout the exploration phase and have not prevented serious accidents from occurring.

The Impact Statement makes repeated reference to the use of oil spill clean-up countermeasures as a real option that will have a substantial beneficial effect in reducing residual impacts to minor or negligible levels and yet the countermeasures section (4.7.1.6 in Vol. III(b) clearly states that the harsh offshore environment and unfavourable characteristics of the oil makes these ineffective. The proponent places emphasis on the hope that wind and wave action will quickly disperse slicks and yet the oil properties suggest this may not occur. Monitoring slick movement appears to be the only significant action that the proponent proposes to carry out following a spill of any size and duration. Information on potentially useful containment and clean-up techniques is included in the background studies. The proponent should provide a more detailed discussion of these in the EIS.

No specific assurances are given that research into techniques for cleaning up waxy oils will be undertaken. Rather, the proponent proposes "to follow the development of new systems for better sea-keeping characteristics and improved capability to handle viscous crudes". The proponent should encourage support through the Environmental Studies Revolving Fund and/or fund research themselves. Environment Canada notes that in the July 9, 1985 (update) of ESRF, a study funded for \$41,548 is being conducted on "Countermeasures for Dealing with Viscous Waxy Crude Oils" by S.L. Ross Environmental Research Ltd., Ottawa, Ontario.

Ross (1984) concludes that in-situ burning in conjunction with fireproof booms could remove up to 90% of the oil released from a 30,000 m³ batch spill, 40% from a 9,000 m³ batch spill and 25% from a 48,000 m³/day surface blowout. The consultant (Ross 1984) goes on to suggest that oil well ignition is a viable countermeasure for preventing surface oiling from above-surface blowouts and "obviously, should be the first oil removal measure considered". The use of fire-proof booms, particularly under rough sea conditions, is still in the developmental stage. The percentage of oil which could be removed appears to be overly optimistic, nevertheless, the proponent having raised the possibility of the applicability of this technology, should at least have discussed the use and consequences of this countermeasure in their impact statement.

The proponent indicates that over two years were spent developing procedures for emergency preparedness; a more comprehensive discussion of such procedures should have been included in the impact statement. The information included is too general to provide assurance that an adequate environmental response plan is forthcoming. It is not clear what the purpose of the response plan is, given that the only stated countermeasure capability is to track the progress of the slick. A supplementary discussion of viable countermeasures response is, therefore, recommended.

The shoreline characteristics are adequately described in Vol. III(a) and yet no attempt has been made here or elsewhere to conclude whether the shoreline would have to be cleaned up if oiled and if it was, to identify the techniques/equipment suitable for the task (see also Section 3.4).

3.4 Ecological Impacts of Oil

"Present evidence supports the concept that petroleum in the marine environment does not reflect the "doomsday" potential claimed by some a few years ago. However, exposure of some species and development stages to petroleum and its derivatives under certain environmental conditions clearly can result in substantial damage to marine life . . . Whether or not petroleum entering the marine environment will have substantial or minimal impact depends on interactions among complex variables that are only now beginning to be understood" (Malins and Hodgins, 1982).

The Impact Statement has not dealt adequately with the possible effects on the marine ecosystem of either chronic oil discharges or major oil spills. In Volume IIIa, the Impact Statement gives an extensive review of the marine ecology of the Grand Banks based on both historical information and research sponsored by the project proponents. However, in Volume IIIb, the Impact Statement concludes that except for marine birds, impacts on the marine ecosystem range from "no impact" through to "negligible" to "minor" impacts (VIIIb, Table 4.7-4, 83). Unfortunately, the details of how these impact ratings were determined are not presented, so it is difficult to assess the accuracy of the conclusions. Generally, Environment Canada considers that the Impact Statement presents an overly optimistic picture of the environmental effects (or lack of them) resulting from a major oil spill into the marine ecosystem of the Grand Banks and the coastal zone of Southeast Newfoundland, without demonstrated or demonstrable foundation for such optimism.

Increased hydrocarbon concentrations in the marine waters of the Grand Banks, and probably in coastal waters along tanker routes near the south coast of Newfoundland are believed to be inevitable if this project proceeds. Quantities are not easily predicted since these would be

influenced by operational practices (normal drilling and production discharges, and chronic minor spills) and by major accidents (blowouts, tanker accidents, etc.). However, any increases in hydrocarbon levels will have some adverse effect on the marine ecosystem.

3.4.1 Effects of Petroleum on Marine Organisms

The toxic effects of various types of petroleum products ranging from crude oil through to highly refined fuel products have been the subject of extensive scientific research over the past two decades (NAS 1985). Since no reference was made in the Impact Statement to any of these studies, a brief summary of published toxic effects of crude oil on marine plankton, benthos and fish is provided for the information of the Panel. (The Panel is referred to the United States National Academy of Science Report (1985) on the subject for a more detailed evaluation than is possible here.)

The toxic effects of pollutants should be considered not only in terms of acute lethality **but also in terms of acute sub-lethal effects and chronic toxicity.**

Crude oil or at least some of the constituents of crude oil are known to cause all three types of toxicity (lethal, sub-lethal and chronic) to marine organisms. Generally, the aromatic hydrocarbons are considered to be the more toxic components of crude oils. These aromatic hydrocarbons include such compounds as benzene, toluene, naphthalene and xylenes. These aromatic hydrocarbons also have a much greater water solubility than the other crude oil components. Therefore, since the more toxic components are the ones that are more likely to dissolve in the water, the risk of exposure of marine organisms to these compounds is increased. Due to surface water circulation during, for example, storm events, hydrocarbon levels in the water column can be especially high immediately after a spill, or blowout.

Physical effects of oil spilled in the offshore include coating of organisms and habitat alteration. Coating of marine organisms usually involves weathered oil which has lost most of its more toxic soluble aromatic hydrocarbons through evaporation into the atmosphere or dissolution into the water column. Plankton are particularly susceptible to coating by oil. Oil released from a sub-sea blowout has the potential to contaminate sediments in the immediate vicinity, rendering them uninhabitable by the normal community. Oil residues, such as tar balls and viscous mats, may also sink to the bottom with similar results.

Laboratory studies have determined that adult marine organisms may exhibit acute lethal effects from exposures to concentrations of soluble aromatic hydrocarbons ranging from 1-100 ppm. Larval stages are more sensitive and may be killed by concentrations of soluble aromatic hydrocarbons as low as 0.1 ppm (Moore and Dwyer, 1974). In a study conducted specifically on Hibernia crude oil using native Newfoundland coastal fish and invertebrates, the acute lethal concentrations ranged from 16 ppm to 205 ppm, which indicates that Hibernia crude oil displays similar acute lethality to other crude oils (Atlantic Biological Services, 1980).

A summary of sub-lethal toxicity effects and concentrations of hydrocarbons causing these effects is given in the Impact Statement (VIIIb, Table 4.3-7, 48) without an explanation of the significance or meaning of the effects noted. The table indicates that levels of hydrocarbon as low as 1 ppb may impair an organism's chemoreception abilities which could cause difficulties for the organism to find food or avoid predators. Levels of 10 ppb may cause tainting (impart an oily flavour) to the flesh of fish and shellfish.

Petroleum hydrocarbons have been shown to have toxic effects on most trophic levels of marine organisms ranging through phytoplankton, marine plants, benthic animals and fish. Since Hibernia crude oil has been demonstrated to have similar toxic properties to other more thoroughly studied crude oils, it is reasonable to conclude that Hibernia crude oil discharged to the ocean either through regular operations or through accidental releases will have similar effects on marine organisms on the

Grand Banks. The toxic effect depends on the concentration of hydrocarbon in the water and the duration of the exposure. Detecting such an effect may be beyond our capabilities, at this time, however, **the proponent should clearly indicate predicted concentrations of hydrocarbons from routine or accidental losses likely to occur and, where relevant, indicate the necessary research and monitoring it is prepared to undertake to ensure impacts are fully understood, minimized and, if necessary, mitigated.**

3.4.2 Offshore Ecosystem Effects

Environment Canada considers that the proponent has **under-estimated the possible impacts on the marine ecosystem of both chronic discharges of oil and accidental oil spills.** The marine environment of the Grand Banks is a very complex ecosystem with interactions between many organisms at many trophic levels (Impact Statement Volume IIIb, Table 3.2-1, 105 and Figure 3.2-41, 217). These relationships between organisms and factors which affect the production rates of individual organisms and populations of organisms are not well understood.

The method used in this Impact Statement to describe impacts is not rigorous (see also Section 3.7.1). Impacts are assessed only in terms of each individual discharge and activity, isolated from other concurrent discharges that may exert additive or even multiplicative effects. Only impact at the population level is considered in the impact definition. **Long term impacts, such as a build-up of contamination around the well-sites and in traffic lanes or from other oil and gas and ancilliary developments and other uses, have not been addressed in the Impact Assessment.**

Although the Impact Statement indicates the population level of impact is being considered when evaluating environmental effects, the evaluation is actually far more restrictive. Only standing crop or simple

numbers of individuals are considered. Turnover rate or standard demographic descriptors, such as intrinsic rate and age structure, are not utilized but should have been. Ecological effects can occur on every level of biological organization from sub-cellular to ecosystem. By concentrating on the population level, the proponent also makes several unstated assumptions which then influence the results of "no" or "negligible impact". In particular, the proponent argues that natural variability is so large that most population estimates cannot be determined with certainty or that no detectable effects can be found between natural and perturbed levels, however, no estimate of natural variability is given for any of the populations. After a review of the Grand Banks Oceanographic Data set (McLaren Plansearch 1984), it becomes apparent that some of the sampling and laboratory analyses are not sufficiently detailed to determine what type of variability estimates could be calculated. For some parameters, however, it is possible to make these calculations and they should be done from the raw data. There are many oceanographic parameters that are not highly variable. The field program did not measure variability effectively. **Subsequent monitoring efforts should correct this.** Natural variability can be handled effectively in a well planned program. High variability in a particular component is a function of the position of that component in the overall ecosystem, knowing the variability level can help identify its ecological function in a causal sense if the appropriate techniques are used.

Although most of the impacts on organisms of the Grand Banks are anticipated to be sub-lethal, there is the potential for unexpected and significant effects on populations or communities of organisms. Individuals may not be killed outright but their ability to feed or reproduce may be impaired and the more sensitive young may not survive. With the relatively high rate of population growth of most zooplankton such effects could result in rapid collapse of certain components of the food chain, affecting productivity or survival of other organisms in the complex offshore ecosystem (Gulland, 1973; Levinton, 1982; Nybakken, 1982). Impacts which are rated "minor" or "negligible" by the proponent might under some

circumstances more realistically be considered more significant; for example, minor impacts on a small discrete population may still be unacceptable.

Despite extensive literature that reports severe, potentially significant sub-lethal effects on many marine organisms at low levels of hydrocarbons (i.e., less than 0.1 ppm), the proponent makes the assumption that dilution of the pollutant and quick replacement of affected individual organisms will reduce impacts to localized or negligible levels. **This assumption may be incorrect (NAS, 1985). Serious ecosystem impacts may occur which have not been anticipated in the Impact Statement. Without an appropriate monitoring program, such changes may not be identified early enough to be effectively mitigated.**

Throughout the Impact Statement, it is implied that major circular current patterns (gyres) in the Grand Banks contribute to retention and subsequent high concentrations of detritus, nutrients, and ichthyoplankton. It is reasonable to assume that these same conditions which create a highly productive and biologically rich environment may also result in increased retention and persistence of spilled oil and other contaminants (both from chronic discharge, small spills and major accidents and blow-outs) within the Grand Banks area. Hydrocarbon levels, as noted in the Impact Statement, are already elevated above background levels, probably due to the present level of chronic discharges from ship traffic in the area. **The potential for long term cumulative impacts, such as reduced productivity, from all discharges and spills, is an important unanswered question.**

3.4.3 Coastal Impacts

The authors of the Environmental Impact Statement for the Hibernia Development Project have not provided a thorough assessment of impacts in the coastal zone. Although shoreline is included in their "study area", it is limited in extent and impacts are not seriously considered due to the

assumption that oil spilled in the Hibernia field will rarely, if ever, reach the coast of Newfoundland. We do not consider this argument valid (see Section 3.3) and, therefore, a more thorough evaluation of coastal impacts is required. For example, considerable study has been conducted on the effects of the "Arrow" and "Kurdistan" tanker accidents in the Atlantic provinces on various types of shoreline and associated flora and fauna (Keizer et al., 1978; Stewart and Marks, 1978; Gordon et al., 1978; Gillfillan and Vandermeullen, 1978; Thomas, 1978). **Little of this work is referenced in the Impact Statement despite its relevance to coastal situations in Newfoundland.** Although the physical behaviour of oil on shorelines is described briefly along with some biological impacts, specific detail is needed to assess environmental effects and to quantify risk. The biophysical description of the southern and southeastern coast of Newfoundland is lacking in adequate detail. **Sensitivity mapping of the coastline is available and should be discussed in the context of coastal risk, protection and clean-up potential.**

Coastal areas with shallow water, high nutrient levels, and dynamic water circulation are the most productive component of the marine ecosystem (Mann, 1982). Rapid and prolific growth of macroalgae contribute a massive carbon input utilized by intertidal and nearshore organisms. Studies have demonstrated significant impacts from oil spills on fish species and coastal crustacea (especially juveniles) and on other benthic and intertidal invertebrates. Effects range from reduced growth, reproductive depression, death of juvenile forms, removal of certain species, tainting, and subcellular metabolic effects (NAS 1978). The available literature must be better referenced to support conclusions drawn relative to impacts of oil in the coastal environment.

Shoreline

Sand beaches occur rarely on the south and southeast coast of Newfoundland but cobble beaches and pocket beaches (mostly cobble) are frequent. Oil reaching such areas would have an impact on recreation and their aesthetic value ranging from minor to major depending on its chronic

occurrence or catastrophic inundation. As pointed out in the Impact Statement IIIb (84, 4.7.1.7), cobble beaches will retain deeply buried oil for long periods (longer than sand or gravel beaches) and release it over time under warmer conditions or more active storms, so that the impacts could be recurring or chronic. Impacts on certain species have been documented to continue as long as 6-8 years after an oil spill invaded coastal bays (Gilfillan and Vandermeulen, 1978). **Effects on capelin spawning beaches could be severe (as stated) and such beaches should be clearly identified with protection or contingency measures in place. The probable value of available counter measures should also be discussed.**

Impacts of oil on coastal bird sanctuaries is a serious threat but is not adequately addressed. Again the focus is offshore and not coastal, ignoring the threat of coastal oil on young and immature seabirds which remain close to breeding areas during their early development. Even oil spilled offshore may move inshore unpredictably if it sinks below the surface and is not subjected to movement by wind. Trajectories for subsurface oil movement are needed (see also Sect. 3.1, 3.3).

In the coastline of the limited "study area" 47 marshes are identified (IIIa, 97, Figure 3.1-57) some of which are presumably barachois marshes. They are considered to be vulnerable to oil released from the Hibernia field, but these and many more along the south coast would be affected even more by oil released during transportation. The Impact Statement states that oil reaching barachois marshes is "likely to persist for long periods", but impacts on the biota are not fully addressed. The potential effects of marsh contamination on birds using the marshes, or on mammals that live in or around marshes should be presented.

Salt marshes are a rare habitat in Newfoundland and are particularly vulnerable to oil. Their exact location and susceptibility to oil spilled at or in transit from Hibernia is needed in order to fully assess the impact of this project. For salt marshes, as with other vulnerable shore types, the ecological consequences of oil contamination must be evaluated.

It is true that much of the south and east coast of Newfoundland is rocky with high wave energy and is probably minimally effected by spilled oil. Nevertheless, several large deep bays; St. Mary's, Placentia, and Fortune and numerous deep fjords are sheltered from the high energy zone and offer varying degrees of protection from wave action. The potential for persistence of oil on the shoreline in these areas is much greater. What this means in terms of impact is not described, but often the exposure of marine organisms and birds as well as mammals feeding intertidally will be greatly prolonged, with the chance for physiological effects increased. Incidents of shore mammals such as otters dying from ingesting oil through food or grooming have been recorded (Baker 1981). **The introduction of oil into a fjord deserves special consideration due to the unique water circulation characterizing fjords.**

Warm summer temperatures in sheltered inlets or bays are likely to cause an influx of hydrocarbons at a time of high biological activity, an event which may occur over a number of years until stranded oil has completely weathered. **The proponent has not adequately addressed impacts on aquaculture, shellfish harvesting and other inshore fisheries.** The long term exposure of birds using sheltered contaminated inlets or estuaries to hydrocarbons should also be discussed. The recreation potential of sheltered coastal bays could be affected by persistent oil for a period up to 4 or 5 years. **There is no indication of the recreational potential of vulnerable coastline.**

Onshore Impacts

While land-based projects will be reviewed in another forum, the proponent remains responsible for evaluating and presenting the potential cumulative effects of the project's onshore components in their **impact statement**. In the context of impacts on land and resource use, the Impact Statement states that "no analysis was done on land uses from speculative activity or from spinoff uses related to Hibernia because no data was available" (Vol. IV, page 315). As a result, there is insufficient information in the Impact Statement for a suitable assessment of cumulative

onshore impacts from land-based facilities and other ancillary developments likely to result from the Hibernia development. The lack of information in the Impact Statement concerning the onshore impacts of the Hibernia development is unacceptable, particularly since the proponent considers the impact statement as a planning tool.

Spin-off developments must be adequately evaluated from an environmental perspective in order to facilitate orderly planning and avoid incremental environmental degradation of terrestrial and aquatic ecosystems. **We recommend that all land-based facilities and ancillary developments associated with Hibernia be subject to full impact assessment.** The ancillary developments could include: powerlines, roads, railways, waste disposal areas, quarries, work camps, recreational lands, etc. Without adequate environmental planning, any of these Hibernia-related ancillary developments have the potential to degrade the quality of the environment. These projects must be evaluated to adequately assess the cumulative effects of Hibernia development.

During formal environmental assessment of onshore developments subject to provincial environmental assessment procedures, Environment Canada normally participates in the reviews and provides data or advice in areas for which it is responsible or has expertise.

The North Sea experience (Robertson 1984) clearly indicated that impacts from land-based facilities are of equal or greater concern than offshore impacts and that a regional planning approach that directs development to environmentally acceptable locations minimizes impacts. Through its facilities siting program, the Newfoundland government has shown leadership in this integrated approach. **Serious consideration should be given to implementing a more broadly based environmental strategic plan (similar to that used in Scotland) for both offshore and onshore areas potentially affected by Hibernia, its "spin off" developments and subsequent offshore development.** This approach would allow orderly planning to develop and would avoid problems created by planning on a narrow-focussed, project-by-project basis.

Although no detailed biophysical data were provided on "generic" construction and operational support sites (i e., Argentia and Come-by-Chance) in the biophysical assessment volume of the Impact Statement (Vol. IIIa), impact predictions were provided in Volume IIIb of the report. Impact predictions were therefore made without the provision of baseline information or any other form of quantitative information. This is an unacceptable approach to impact prediction.

Other ancillary facilities need more documentation in the Impact Statement. The impacts of rail, road and powerline construction and other necessary infrastructure on terrestrial and aquatic ecosystems should be discussed. More detail on how cement will be transported to the site from Corner Brook and the associated environmental and safety concerns is required. The Impact Statement contains no detail on borrow areas which could be a major consideration should a GBS be built.

3.5 Risk Analysis

3.5.1 The Need for Environmental Risk Assessment

The acceptability of the risks induced by the proposed development must at all times be weighed against the anticipated benefits. For the purposes of this review, risk is defined as the probability that something undesirable will happen.

The probability of an event occurring is dependent upon the inherent uncertainties in the complex systems we wish to understand; especially when we want to predict future behavior of such systems. "Uncertainty" is a commonplace idea when discussing the weather or economic forecasts. Likewise, it has been used extensively in health to estimate mortality, disease incidence, birth defects, mutations, etc. The nuclear regulatory and other industries have used risk analysis for a variety of safety determinations among other uses. **Risk measures are increasingly becoming part of legislative and management decision making processes related to these fields (NAS 1983).**

To be valid, evaluation of the environmental risk, that is, risk to organisms or ecosystems must first be based upon an evaluation of the engineering risks. Engineering risk includes the likelihood of a mechanical failure, human error, damage to the platform and loss of hydrocarbons or other toxic substances to the environment. Secondly, environmental risk must be based upon an understanding of the life histories of the ecosystem component organisms and an understanding of their variability in relation to physical and chemical parameters and relations to each other in the food web. The inherent variability of environments is re-enforced by human interventions which are often cumulative, multiplicative, indirect and counterintuitive. This argues for the need to develop objective risk analysis tools for ecological systems so that uncertainty can be quantified and evaluated rigorously. If this is not done, risk-benefit decisions

involving the environment will continue to be made with an insufficient scientific basis. The risk-benefit trade-off has to be made explicit and this can only be done with a firm quantitative basis.

3.5.2 Engineering Risk

In the Impact Statement, "risk" is most often associated with the engineering components of the document but **no evaluation of acceptability of risks can be made since risk assessment has yet to be carried out for the development.** A thorough engineering risk study is required which will allow relative risks for the two development alternatives to be evaluated. The diversity of opinion among knowledgeable engineers on the subject of risks in developing offshore oil fields and prediction uncertainty is high. One view expressed was that the GBS would never withstand a major iceberg impact or indeed repeated bergybit collisions. Is this likely? What are the relative risks from storms and icebergs for the two development plans? The proponent should present this risk analysis as part of their justification for their choice of the production system.

3.5.3 Environmental Risk

Compared to an industrial risk analysis that often emphasizes human safety, for an environmental risk analysis of a system like Hibernia, there are large numbers of non-human organisms which will become involuntary risk takers and which clearly do not stand to benefit from an oil-enhanced economy. The challenge is to clarify the environmental risk portion of the risk-benefit ratios so that evaluation of environmental risks can be made

objectively and subsequently defended in public forums. The Hibernia Development is an excellent example of the potential for conflicting perceptions of risk by different interest groups. The best way to resolve these conflicts is to have relative levels of risk quantified as rigorously as possible. To identify an implied threat or hazard is not sufficient to demonstrate risk, it must also be shown that at least a potential causal pathway between the hazard and target exists. The Impact Statement has not successfully done this.

The proponent should quantify uncertainty with regard to environmental risk for: (1) catastrophic events such as a major oil spill as well as (2) chronic environmental deterioration from routine operations of the development. This needs to be done for both development scenarios if a well-reasoned conclusion is to be reached on which development plan would cause the least environmental risk. The quantification of risk is different for the catastrophic and chronic cases. In the case of chronic environmental deterioration, there is usually no adequate, historical data base for the probability of rare events but the identification of cause and effect is usually quite clear and easy to document. In addition, the public is often most concerned over the catastrophic event such as major oil spill or the sinking of a platform, however, the common risk from small recurring events might be much greater than for a single catastrophic event.

There is almost no mention of risk in the environmental portions of the Impact Statement and no attempt to consider risk. The Impact Statement methodology is therefore not adequate. The proponent avoids the risk question by stating repeatedly that there are no impacts or only small, negligible ones. If one writes statements of complete certainty assuming the Grand Banks is a "determined" ecosystem that is completely understood, then there is no place for uncertainty and consequently no need to calculate risk. This overall approach is not acceptable. Environment Canada is prepared to work with the proponent to gain a mutual appreciation of the environmental risks related to possible catastrophies and each of the development alternatives.

3.6 Operational Discharges and Control

From an environmental perspective, the discharges of major concern include produced water containing dissolved and dispersed petroleum hydrocarbons and often high concentrations of heavy metals, contaminated drilling muds and oily water discharges from separators and deck drainage.

The zone of influence of a project is the area within which the project will have an impact from either operational discharges or physical disruption. **Environment Canada is concerned that actual extent of the impact area will be considerably larger than that depicted in the Impact Statement.** The zone of influence for the Hibernia project is depicted in Vol. IIb as covering an area of approximately 8 km in diameter centered on a production platform. This will probably be more than sufficient to encompass the impact of routine discharges but is not sufficient for the chronic oil spills that occur from production facilities. **A considerably larger area than 8 km. should be considered and such events as chronic oil spills should be included within the zone of influence of the project.**

There are a number of large volume discharges from a production facility for which Mobil has developed dispersion plans and suggested treatment and discharge depths. Environment Canada considers that some of these discharges can be significantly reduced or eliminated by consideration of alternate methods of handling, such as reinjection of produced water into the formation.

3.6.1 Produced Water

The volume of produced water to be discharged at full production, with either production scenario, is estimated to be a maximum of 14,300 m³/day. The maximum oil content of the produced water will be controlled

by regulation or guidelines at 35-40 mg/l. This amounts to approximately 0.32 m³/day (2 barrels/day) but could increase to more than 3.2 m³/d (20 barrels/day) during upset conditions. The efficiency of oil/water separators is dependent to some extent on the stability of the platform which they occupy and therefore gravity separation would be less efficient on a floating platform than on a GBS. It is suggested that the produced water would be treated in a system that might include air floatation and inclined plate separators. This type is at the level of best practical technology (BPT) and by using it the concentration of oil in produced water would be expected to meet regulatory requirements.

Several references are made in the Impact Statement to discharged or spilled materials reaching a thermocline and dispersing at that depth. If this is the case, the thermocline will reduce the dilution and in fact, act to concentrate contaminants at a depth which could be critical to planktonic and pelagic species. The maximum rate of phytoplankton production, in fact, coincides with this depth. The thermocline acts as a natural barrier to vertically migrating zooplankton and ichthyoplankton and large numbers of these species are often concentrated at or just above the thermocline. Such species could be exposed to unusually high levels of contaminants at considerable distance from the source, especially if movement along the thermocline is accelerated by currents. This possibility should be addressed by the proponent and estimates of potential hydrocarbon concentrations at the thermocline should be made.

Discharge below the thermocline appears to increase dilution as stated in the Impact Statement but also bring the discharge into deeper and less productive waters. Discharge below the thermocline is a minimum mitigation recommendation for the discharge.

There is a possibility that the produced water discharge can be eliminated entirely. Mobil has not considered in its mitigation of impact of produced water the option of including it with injection water for re-injection into the formations. Since it was originally part of the formation water this should present no difficulties. This is especially

important when the possibility of breakthrough to the producing area of injection water, and associated biocides, is considered. The acute lethal toxicity of the treated injection water could have a detrimental effect not adequately described in the Impact Statement, but if produced water is re-injected, not only is one oily water discharge eliminated, but the potential effect of breakthrough water is also eliminated.

3.6.2 Cooling Water

Once through cooling water will be treated with chlorine and possibly biocides to reduce the settlement of fouling organisms in cooling water pipes. This is a common practice for most salt water used for cooling. A large portion of this water will, it appears, be used as injection water since it is estimated that 180,000 m³/day will be used and only 120,000 m³/day will be discharged. While we agree that the free chlorine content of the cooling water will not likely have any detrimental effects on the marine environment, the biocides used may. Mitigation of this potential impact has not been fully considered. Since disposal below the thermocline could reduce the impact on the biologically productive zone and ensure more stable temperature regimes near the production facility, it is recommended that this option should be explored by the proponent and revised plume models prepared.

3.6.3 Drilling Muds and Cuttings

Two types of muds are proposed for use; water base and oil base. Water base muds have traditionally been used offshore and, other than the potential problems of heavy metal contamination, present no significant problems. Mud components should, however, be screened for bioavailable metal contamination before they are approved for use. A potential pollution problem does arise when diesel oil is added to drilling mud to free stuck drilling pipe. The diesel becomes emulsified in the mud and common practice is to eventually discharge it overboard.

Oil based drilling muds have been used offshore in a number of locations. Concern over the environmental effects of diesel oil has prompted the industry to develop a base oil substitute referred to as mineral oil or alternate base oil. The acute toxicity of these oils is considerably less than diesel and the effects recorded to date indicate that the mud formulated with alternate base oils is less acutely toxic than some of the water base muds. **It is recommended that the proponent note in the Impact Statement that the new mineral oils will be the base oils used, notwithstanding that present guidelines do severely restrict the use of diesel oil. Considering the volume of oil to be discharged with cuttings during development, the designation of 15 g/100 g as an achievable discharge limit would seem reasonable (UKOOA et al. 1983).**

3.6.4 Tanker Ballast and Storage Displacement Water

Ballast water from shuttle tankers and the floating storage vessel present no problems for Environment Canada as long as the proponent holds to its commitment that all tankers and the Floating Storage Vessel have segregated ballast. Ballast water discharges from crude oil tankers without segregated ballast systems have resulted in environmental problems throughout the world (Levy, 1984, NAS, 1985).

Storage Displacement Water discharges do pose potential problems for the environment. The long time that water and oil are in contact in the storage cells of the GBS may allow for a part of the soluble portion of the crude oil to dissolve in the water. Discharge limits have not been established for the oil content of this water and the proponent presently proposes direct discharge to the ocean without treatment. The Impact Statement has estimated that the concentrations of oil will be between 10 and 35 mg/l and dilution by 1000 times within 1 km. Based on the North Sea experience 10 mg/l appears to be an average oil concentration for the majority of the storage displacement water, however, the proponent does not address the concentration of oil in the oil/water interface in the storage vessels.

At the oil/water interface oil/water emulsions are likely to be formed (see Section 3.3) which may have concentrations of oil in the 10-50% range. The proponent has not addressed the requirements for treatment of this layer of emulsion during discharge of the storage displacement water. It would be expected that if such emulsions were discharged it would present problems in the water column and surface layers.

The proponent should consider the possibility of utilizing an oil/oil displacement system for the storage vessels in the GBS to eliminate the need to handle oily displacement water.

3.6.5 Minor Discharges

Deck Drainage

The proponent has separated deck drainage into two distinct sources: 1) Discharges from the drilling floor and machine servicing, and 2) other sources, e. g., rainfall, deck wash down. In both cases the drainage will flow to oil water separators for treatment by gravity separation and the oil collected for disposal. The efficiency of the oil/water separators is in question since not only will they receive the oily water but also rig wash, a detergent, which will emulsify the oil, reduce the efficiency of the separators and increase the oil in solution. It is recommended that the proponents incorporate a system for breaking down emulsions or develop some alternate method of disposal of deck drainage.

Well Workover Fluids

This minor discharge occurs sporadically based on need to increase production from wells. The proponent plans to discharge these very acidic solutions of hydrochloric and hydrofluoric acid within the produced water. Although dilution will significantly affect the pH and bring it close to that of sea water, pretreatment to raise pH levels prior to incorporating it into the produced water will significantly reduce the potential for heavy

metal leaching from both the workover fluid and the produced water. The proponent may be required to incorporate a pre-treatment system for well workover fluids into the platform design.

Produced Sand

Produced sand may need to be collected and treated to reduce oil content before disposal. The Impact Statement may provide indication of the quantity of oil that might remain on produced sand.

Hydrostatic Test Fluids

Hydrostatic fluids used to test in-field pipelines will utilize an oxygen scavenger and possibly a biocide. Mobil has not identified the biocide to be used, the treatment necessary to neutralize the biocide prior to discharge or the volumes of hydrostatic fluids to be used. The biocide should be identified specifically and an estimate of the acute toxicity of the test fluid and quantity to be used should be provided.

3.6.6 Compliance & Audit

Regulations and guidelines are being established for some of the discharges but not all. The proponent should be required to monitor all discharges for oil content on a regular basis. At start of production, monitoring should be frequent for each discharge; after discharge levels have been confirmed to be within regulatory limits, the sampling can be carried out less frequently. This data should be supplied to the Canada/Newfoundland Petroleum Board and made available to other agencies such as Environment Canada.

Regular audits of the proponent's monitoring will be conducted by regulatory agencies. Audits should be conducted once or twice per month during start up and quarterly after operations have stabilized.

3.6.7 Abandonment

Upon abandonment of the Hibernia field, the proponent should expect to be required to remove all seafloor obstructions that may interfere with fishing activity including infield pipelines and the GBS platform itself. An abandoned platform could pose a significant threat to shipping unless it is properly maintained as an aid to navigation.

3.7 Effects Monitoring

This evaluation focuses on effects monitoring as opposed to compliance monitoring. The latter, which has been discussed in Section 3.6, applies to the routine monitoring of regulated discharges to ensure that they comply with pre-set limits on the amounts and concentrations of certain contaminants in the effluent. Effects monitoring alternatively is carried out in order to evaluate the effect of the project on the biological resources and processes potentially impacted by the development. The results of these studies can then be used to verify the accuracy of predictions about impacts outlined in the EIS and to provide feedback to project managers and regulators should unexpected and undesirable impacts be detected.

In the case of the Hibernia development, there is a need to clearly state the objectives and limitations of proposed monitoring programs. Major monitoring of valued ecosystem components (VEC's) may have to be undertaken if ecological effects are to be detected. The interpretation of field data such as bird mortalities in terms of environmental impact will require careful analysis.

While it is accepted that effects monitoring programs should be explicitly related to the major impact predictions outlined in the Impact Statement, **the proponent's method of identifying the subsequent impacts from the Hibernia development cannot be verified due to their qualitative nature (see also Section 3.5).** Qualitative first-order matrices are used whereby impacts are assessed in terms of individual discharges and activities, and in isolation from other concurrent discharges that may exert additive or even multiplicative effects. **Long-term impacts** (such as build-up of contamination around the well sites and in traffic lanes) or from other oil and gas and ancilliary developments, have not been addressed by the proponent. Because the proponent has not evaluated impacts comprehensively or quantitatively, **there is insufficient basis in the Impact Statement to develop an acceptable monitoring program for the Hibernia development and additional analysis is needed.**

3.7.1 Monitoring Sub-lethal Effects

Although the proponent's impact rating definition states that it includes sublethal effects on reproduction, growth, feeding and metabolism, it is clear in the sections on assessment of project components, that acute mortality is, for the most part, the only criterion considered. This narrow definition of impact is the major reason impacts rated by the proponent appear mostly as "minor" or "negligible". Sublethal effects can be of equal or greater significance to the population or ecosystem. For example, recent studies (cf., Moriarity 1983, McIntyre and Pierce 1980) have demonstrated a range of potentially significant effects on marine organisms, including chromosomal aberrations, cytological deterioration of eggs, malformed embryos, reduced or abnormal gonad development, reduced hatching success (both teleost and avian eggs), lesions and tumors, fin erosion, reduced growth and enhanced mixed functional oxidase (MFO) induction, all of which may result in reduction of populations over time. Many of these effects were observed at low concentrations or under actual spill conditions (NAS 1985). It should be recognized therefore that sublethal effects are important in determining the nature and extent of impacts, and should be included in any monitoring strategy.

3.7.2 Limits of Detection

Often, the limiting factor in understanding the significance of pollution impacts is the difficulty of studying the effects under field conditions where other major factors may obscure them. The oceanographic regimes, hunting, fishing, predation, concentrations of food organisms, weather and other external influences can, for example, greatly affect the number of organisms that are observed in a monitoring program. When, as the proponent has done, simple numerical abundance is the only criterion used to identify impacts, it is difficult in a subsequent effects monitoring program to verify these impact predictions. Any reduction in seabird populations and/or fish stocks must be very large before it can be detected in such a monitoring program. However substantial, and possibly irreversible,

ecological (and economic) impacts can occur with very little prior indication. The inability to detect an impact should not be interpreted as "no impact". Accordingly, **the Hibernia Development Monitoring Program should carefully examine methods and techniques for monitoring low level impacts in order to facilitate the introduction of mitigative measures as required before any such impacts become critical.** (See MacIntyre and Pierce 1980, Gray 1980).

3.7.3 Monitoring at the Production Site

Impacts from the production site, as noted previously, are evaluated in the Impact Statement in terms of isolated effects mostly on the benthos, presumably because most (if not all) of the effects monitoring around well sites has consisted of sampling sessile macro-benthos abundance and diversity. However, the macro-benthos are often less sensitive to the presence of pollution than pelagic forms, and because of large variation and heterogeneity, only major reductions (i.e., 50% losses) may be statistically significant (Hargrave and Thiel 1983). Results of such programs may be of limited value for the evaluation of impacts from Hibernia or for addressing the major concerns of this development. Furthermore, the North Sea monitoring studies (UkOOA et al 1983) referenced by the proponent were not intended as effects monitoring programs for other than oil-based mud discharges. Being specifically designed to study the effects of a single contaminant, they are not a valid model for many of the other sources of concern. The proponent has predicted that there will be only minor or negligible lethal and sub-lethal impacts on marine organisms (including juvenile and adult fish, zooplankton and benthos not normally included in monitoring programs) in the vicinity of well. **It is the view of this Department that the proponent's suggested monitoring program will not test these predictions and is therefore unlikely to assist decision-making or serve as an early warning of more severe long-term impacts to the Grand Banks.**

3.7.4 Monitoring Onshore Impacts

Onshore impacts are rated mostly "minor" or "negligible" because the area is either already developed (St. John's), already disturbed (Argentina) or generalized to be local and therefore minor. This approach to evaluating impacts from shore-based facilities is inadequate, particularly because experience elsewhere has demonstrated that impacts from shore-based developments are of equal concern to offshore impacts (Robertson 1984). Monitoring of potential impacts from shore-based facilities was likewise not addressed by the proponent but, in the opinion of this Department, should be included as part of the impact assessment of this project.

3.7.5 Monitoring Coastal Impacts

Impacts from spills on coastal habitats are underestimated by the proponent. There is a large body of literature which suggests that long term severe impacts to productive estuaries should be expected if impacted by an oil spill (NAS 1985). Clean-up attempts have been largely unsuccessful and have often inadvertently caused additional damage. The adequacy of baseline information for monitoring the coastal impacts from a spill or increased chronic oiling has not been addressed by the proponent. The proponent appears to want to limit monitoring to the seafloor and benthos around the well sites. Monitoring related to shore habitats, seabirds and other marine life in relation to major spills, minor spills and chronic long-term discharges does not appear to be included in their plan and should, therefore, be added. Furthermore, the requirements for Environment Canada and other agency involvement should be addressed by the proponent, particularly with regard to the need for increased baseline monitoring and accelerated surveillance of seabird populations. The proponent has not committed itself to a comprehensive program aimed at evaluating even the impacts predicted to be "major" in the Impact Statement.

3.7.6 The Elements of a Monitoring Program

It must be emphasized that this Department believes that the effects monitoring program should focus on ecosystem components which could

act as a barometer of overall environmental degradation. Monitoring such components should provide an early detection of impacts which can be used to implement remedial action to preserve the integrity of other species (e.g. commercially significant fish) located in the Grand Banks. We also believe that this type of monitoring program will serve our needs in the most efficient and cost effective manner.

As noted earlier, the Impact Statement does not clearly state the objectives and limitations of any monitoring programs recommended for the Hibernia development. Accordingly **it is Environment Canada's view that the proponent should be required to prepare, in consultation with those agencies involved, a comprehensive monitoring program.**

In general, this Department believes that the following elements should be addressed in the development of a comprehensive effects monitoring program:

- i) It must be recognized that effects monitoring should be related to anticipated impacts. It is recommended that the proponent, in consultation with concerned agencies, develop impact hypothesis for significant ecosystem components and sensitive areas that will form the basis for developing the required monitoring program;
- ii) Sublethal effects should be incorporated as a barometer of the overall health of the ecosystem. To measure such effects, an assessment of the methods and techniques for monitoring low level impacts in relation to the Grand Banks ecosystem would be essential;
- iii) The monitoring program should address both short-term acute effects (e.g. the immediate vicinity of the well sites, shore-based facilities and any ancilliary developments), and long-term chronic and cumulative impacts on the Grand Banks ecosystem;

- iv) The monitoring program should be related to validation of the adequacy of discharge limits;
- v) Any such efforts should be jointly funded by government and industry and explicitly directed to the long-term evaluation of impacts and management of biological resources in the Grand Banks.

3.8 Socio-economic Assessment

The Environment Canada Review of Socio-economic Impact Assessment is limited to its environmental aspects. Reliability of environmental impact projections stemming from socio-economic impacts depends to a large degree on the validity of the assumptions and methodology that are used in the socio-economic analysis and it is in this context that the following comments pertaining to The Socio-economic Volume are made.

There is a general lack of rigorous analysis of the information provided. Measures of impact significance such as duration, reversibility, cumulative effects, probability of occurrence, relative importance and risks associated with the impacts are dealt with superficially, if at all. Many of the individual impacts on land and resource use are described as small, insignificant, or negligible; **Environment Canada, however, is concerned that the cumulative effects of these individual impacts could lead to significant environmental disruption.**

The uncertainties associated with such statements as: "these estimates should not be interpreted as a prediction of what will happen. Rather, they provide a reasonable indication of what could happen", and ". estimates are based on conceptual designs only and may change substantially once detailed engineering is completed" make it difficult to gain a proper appreciation of the environmental impacts presented.

The absence of social cost-benefit analysis limits the scope and depth of the proponent's assessment, providing no insight into the fundamental considerations for selecting a particular production alternative.

By assuming that approximately 78-79% of direct project employment and 100% of indirect and induced employment will be filled by present residents of Newfoundland, and starting with the projection of low

in-migration based on this assumption, **the full spectrum of socio-economic impacts and consequently the environmental impacts such as the land and resource use from the Hibernia project may have been underestimated.**

Speculative in-migration is not discussed in a satisfactory manner and analyses of land and resource use resulting from speculative activity or from spinoff use are not considered. It is important to recognize that such activities result from the general perception that "things are happening" as much as it does from the manpower requirements of a particular project such as Hibernia. The cumulative effect of Hibernia and other developments, eg., Lower Churchill, will provide a general inducement which is difficult to capture on a project-by-project basis.

In reviewing the background document entitled Hibernia Socio-Economic Impact Statement - Land and Resource Use Study, May 1985, by CBCL Limited and D. W. Knight Associates, Environment Canada notes that a number of key points of concern raised by the authors have been overlooked in Volume IV of the Impact Statement.

For example, as cited below:

- i) "The current situation is such that significant fishing pressure increases could severely deplete the size of a salmon run on key rivers, to a point where the only management strategy would be to close the rivers to all angling until salmon stocks had recovered" (Water and Fish Resource, p. 6.3).
- ii) "As an area is industrialized an improved transportation network, electrical distribution system and water and sewer systems may have to be established. Such developments could conceivably have an adverse impact on fish populations in watersheds" (Water and Fish Resources, p. 6.4.).

- iii) "Resources . . . such as caribou, seabirds, ducks and ecological reserve areas are under threat from two major sources: (1) an increasing and more affluent population; and (2) pollution from related onshore industrial development or a major oil spill" (Wilderness and Wildlife Resources, p. 6.5.).
- iv) "There are two major species of seabird that could be devastated by such an occurrence (oil spill). The first of these is the puffin colony on the Witless Bay Seabird Sanctuary where 80% of the Northwest Atlantic puffins breed. The second is the murre population which is totally pelagic at birth and remains unable to fly for quite a long time afterwards. An oil spill at that stage in the life cycle could kill any affected birds" (Wilderness and Wildlife Resources, p. 6.5.).
- v) "Indirect impacts will be the greatest on the Avalon and Burin Peninsulas due to increased pressure on natural resources in localized areas resulting from the presence of a larger population with increased means of access" (Introduction, p.7.1.).
- vi) "The use of the Placentia Bay area for construction, aggregate extraction and mating of the GBS base and deck may have impacts on wilderness and wildlife resources in the area. Any resource extraction or other development on or next to the Placentia Bay Islands may threaten the local eider duck population . . . The use of these Islands for heavy aggregate, or for local hunting, should be carefully monitored to minimize negative impacts" (Wilderness and Wildlife Resource, p. 7.4.).

As a result of the inadequacies outlined above, discussions on the management of impacts have not fully considered the range of mitigative

measures that may be required. Since there is no evidence of planning for mitigation in the event the predictions of impact are incorrect, a commitment from the proponent to respond to unanticipated consequences would be appropriate.

4. Conclusion

The Hibernia Development Project Environmental Impact Statement is an optimistic evaluation of the probable and possible environmental impacts associated with the production of oil on the Grand Banks. The Impact Statement is extensive and the supporting documentation is voluminous, however, significant errors and omissions have been identified. The limited attention paid to environmental risk in this Impact Statement is a particularly serious omission.

Environment Canada considers that the proponent has under-estimated the possible impacts on marine ecosystems from both chronic and catastrophic discharges. The Impact Statement fails to address coastal impacts and the risk of tanker accidents. These limitations are considered significant deficiencies for a region so dependent on its marine environmental quality for sustained economic and social benefit.

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APPENDIX

Simulated Batch Oil Spill of
30,000 m³ at 46°30'N, 52°20'W
for
January, April, July and September

Prepared for
Environment Canada
by
SeaConsult Ltd.
July, 1985

OIL SPILL MODELLING RESULTS
BATCH TANKER SPILL AT 46°30'N; 52°20'W

In preparing the Environmental Impact Statement, the proponent has chosen not to consider the potential for spills away from the Hibernia development site. Environment Canada believes that the environmental consequences of spills originating from shuttle tankers should be evaluated.

In order to assist the Panel in this regard, Environment Canada commissioned a study by Seaconsult Ltd. simulating a 30,000 m³ batch spill at location 46°30'N; 52°20'W - one of the sites where shuttle tankers will merge with an existing shipping lane. The same input parameters and deterministic trajectory model employed by the proponent to assess the movement of oil spilled at the Hibernia development site has been used here.

Wind input is from the Atmospheric Environment Service (AES) Geostrophic Wind Climatology (GWC). Vectors have been backed 15° and reduced by 12% in magnitude to best represent Grand Banks conditions. Water current input is from the International Ice Patrol residual current field while oil chemistry data pertinent to Hibernia crude have been employed. A six-hour time step has been used in the model.

Batch spill simulations have been executed for every day in the interval 1946-1975 for the months of January, April, July and September. Each simulation evolves until:

- the trajectory reaches a coastline;
- the trajectory reaches an external grid boundary;
- or the remaining volume falls below 5% of the initial volume.

Oil distribution probability plots have been prepared for each of the four months. Probable directions of slick motion and probable spill destinations are defined by these oil distribution probability plots. The basic probability plots are developed from simulations of every possible "day-lot" spill over the duration of the available wind record. Each grid element through which at least one trajectory passed is labelled with a number between zero and ten indicating the percentage of all trajectories which passed through that element, according to the following code:

<u>Code</u>	<u>Percentage of Trajectories (P)</u>
0	$1 \leq P \leq 10$
1	$10 \leq P \leq 20$
2	$20 \leq P \leq 30$
3	$30 \leq P \leq 40$
4	$40 \leq P \leq 50$
5	$50 \leq P \leq 60$
6	$60 \leq P \leq 70$
7	$70 \leq P \leq 80$
8	$80 \leq P \leq 90$
10	$90 \leq P \leq 100$
	$P = 100$

Grid elements through which at least one but less than 1% of the trajectories passed are designated with a dot. The quoted percentages can be interpreted as presenting the probability that oil would reach the indicated site, given a spill originating on any day of the particular calendar month. Grid elements showing no designation are considered, on the basis of these model results, to have negligibly small probabilities of oil impact.

Each oil distribution probability map is accompanied by a summary table of shore impact statistics. This table identifies, by geographical region, those grid elements impacted, and quotes earliest mean and latest times to shore, plus minimum, mean and maximum percentage spill volumes remaining at time of impact, for each impacted grid element.

The results of at least 900 (30 years times 30 days per month) simulations for each month were surveyed to identify that one case in which the earliest shore impact was predicted. This is (subjectively) considered to represent the worst case event for the given month. Trajectory plots and shore impact listings are provided for each monthly worst case scenario. Essential results are summarized as follows:

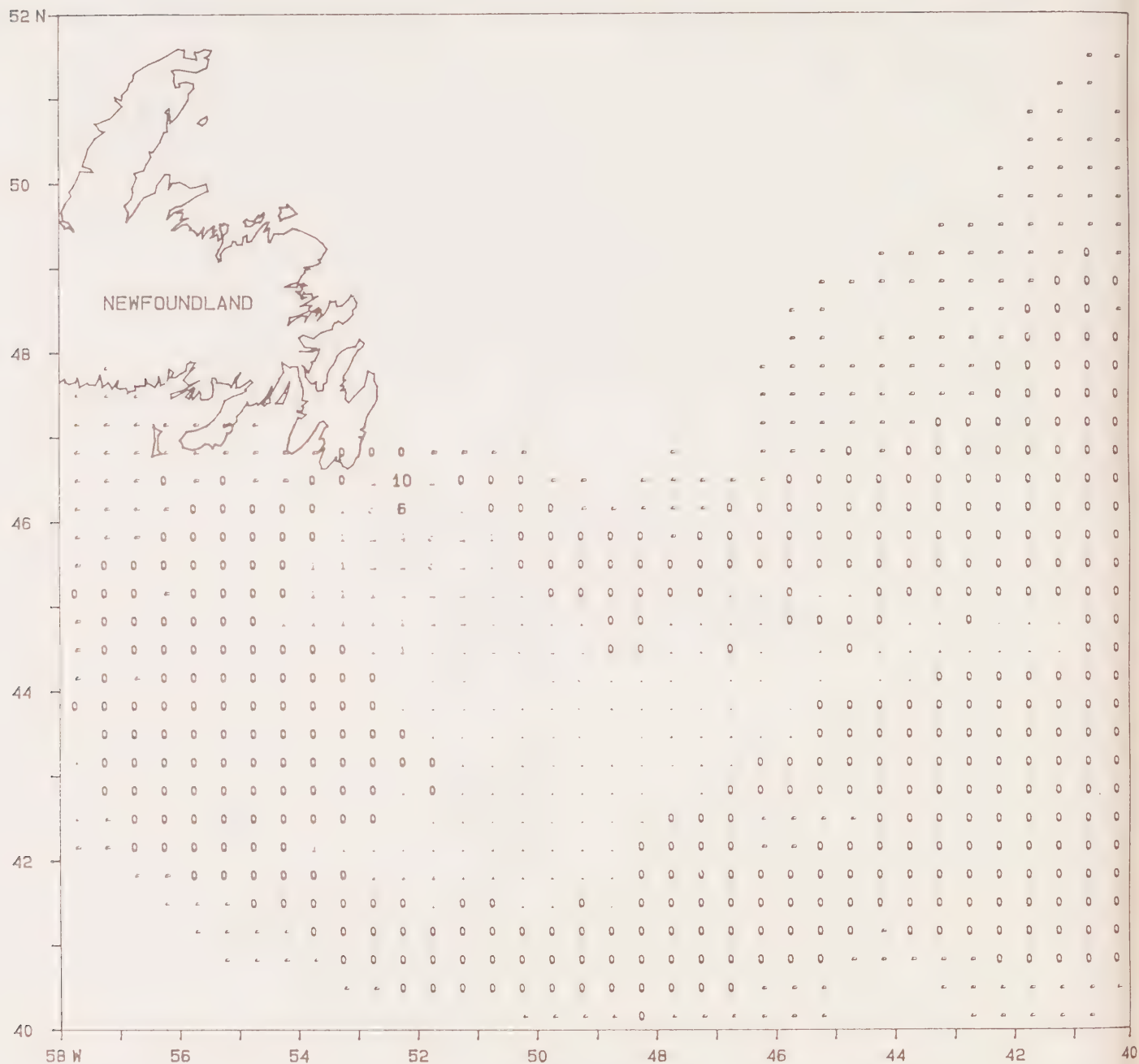
Summary of Worst Case Simulations

<u>Date</u>	<u>Location of Shore Impact</u>	<u>Time to Shore</u>	<u>% Volume Ashore</u>
January 15, 1956	SE Avalon	30 hours	31.4%
April 21, 1971	SE Avalon	30 hours	31.5%
July 2, 1966	SE Avalon	72 hours	25.0%
September 2, 1975	SE Avalon	66 hours	24.3%

Finally, one composite map is provided to indicate the maximum excursion of the batch spill in any of the four months while greater than 10% of fractions lighter than C₁₄ remain in the surface slick.

Monthly Oil Distribution Probability Maps
and Shore Impact Summaries

OIL DISTRIBUTION PROBABILITIES FOR THE MONTH OF JAN



• REPRESENTS PROBABILITY LESS THAN ONE PERCENT

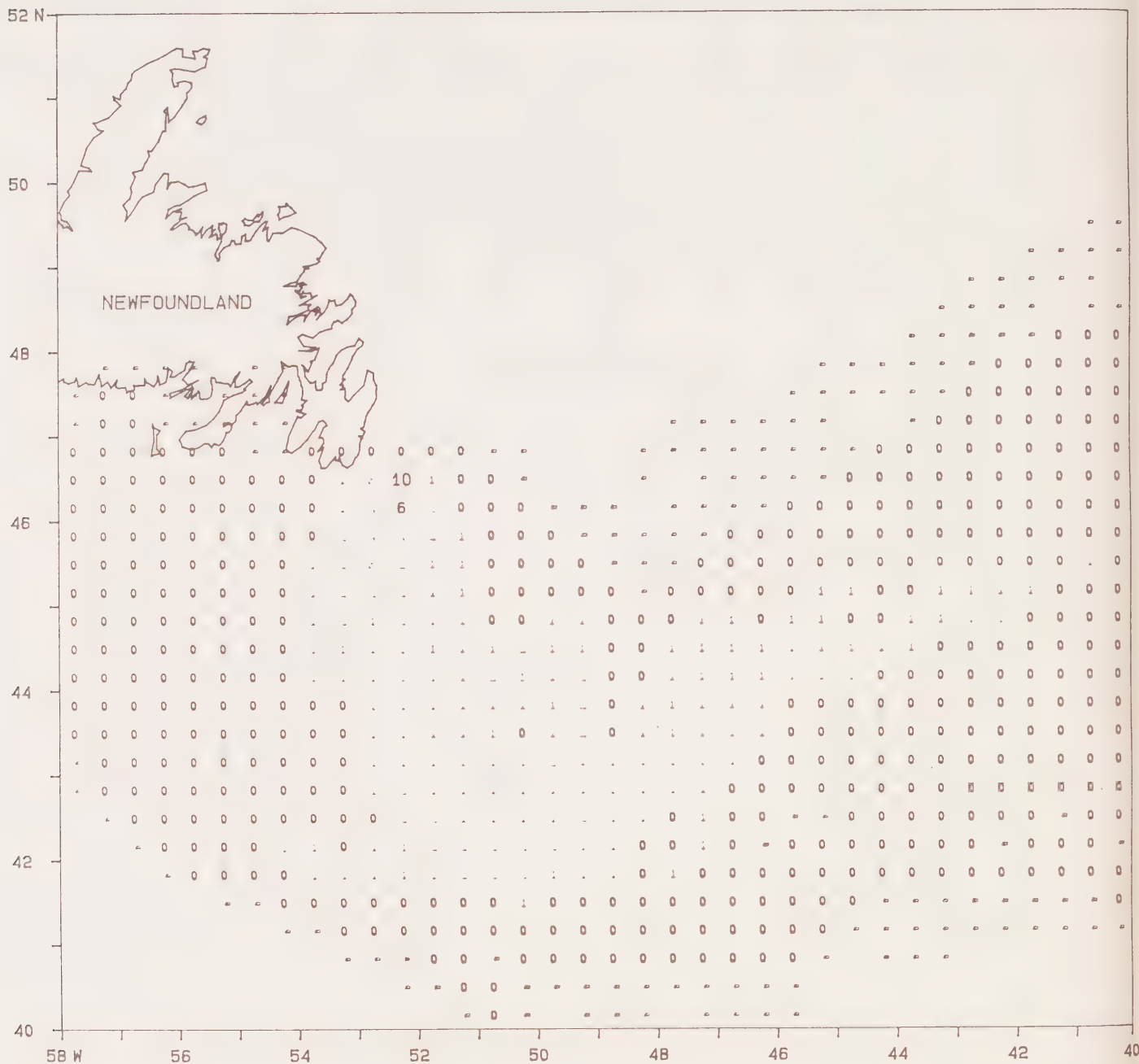
EPS TANKER SPILL

SHORE IMPACT STATISTICS FOR NEWFOUNDLAND FOR THE MONTH OF JANUARY

POSITION ROW	PERCENT COL	MIN VOL. PER CENT	MAX VOL. PER CENT	MEAN VOL. PERCENT	EARLIEST TIME (HR)	LATEST TIME (HR)	MEAN TIME (HR)
13	5	.11	16.	16.	504.	504.	504.
15	10	.11	15.	15.	162.	162.	162.
15	15	.11	15.	15.	138.	138.	138.
15	16	.11	15.	15.	162.	162.	162.
16	27	.11	26.	26.	48.	48.	48.
16	28	.43	19.	25.	60.	420.	161.
16	29	.54	17.	29.	36.	390.	167.
16	30	2.04	16.	32.	30.	306.	100.

TOTAL: 3.55 PERCENT OF 930. TRAJECTORIES ASHORE ON NEWFOUNDLAND

OIL DISTRIBUTION PROBABILITIES FOR THE MONTH OF APR



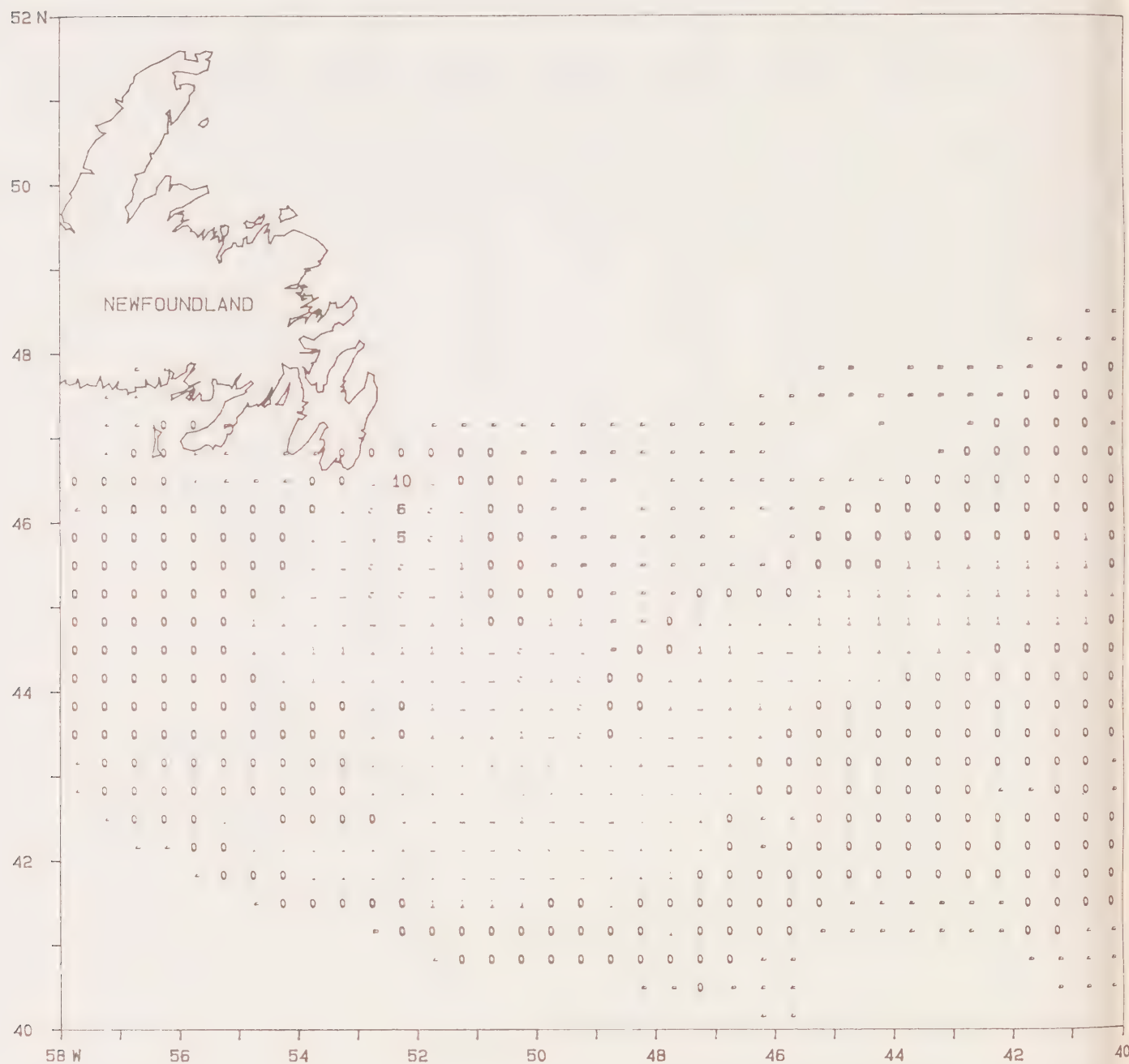
EPS TANKER SPILL

SHORE IMPACT STATISTICS FOR NEWFOUNDLAND FOR THE MONTH OF APRIL

POSITION ROW	COL	PERCENT IMPACTS	MIN VOL. PER CENT	MAX VOL. PER CENT	MEAN VOL. PERCENT	EARLIEST TIME (HR)	LATEST TIME (HR)	MEAN TIME (HR)
13	4	.22	15.	16.	16.	462.	726.	594.
13	6	.11	17.	17.	17.	468.	468.	468.
13	7	.33	15.	18.	17.	414.	624.	516.
13	8	.33	15.	17.	16.	540.	588.	558.
13	9	.11	18.	18.	18.	492.	492.	492.
13	11	.11	13.	13.	13.	726.	726.	726.
13	12	.11	12.	12.	12.	648.	648.	648.
13	13	.11	19.	19.	19.	516.	516.	516.
13	19	.11	16.	16.	16.	336.	336.	336.
13	23	.11	11.	11.	11.	426.	426.	426.
14	15	.11	12.	12.	12.	570.	570.	570.
14	16	.11	14.	14.	14.	660.	660.	660.
14	23	.33	10.	18.	13.	492.	534.	516.
15	10	.44	7.	18.	13.	306.	1350.	674.
15	14	.11	13.	13.	13.	594.	594.	594.
15	15	.22	12.	18.	15.	240.	474.	357.
15	16	.11	21.	21.	21.	420.	420.	420.
15	23	.33	16.	19.	18.	204.	570.	384.
16	24	.33	18.	22.	20.	108.	186.	150.
16	27	1.22	14.	26.	22.	54.	276.	119.
16	28	.56	18.	28.	23.	48.	312.	128.
16	29	1.11	16.	28.	23.	48.	276.	148.
16	30	2.78	16.	32.	23.	30.	324.	118.

TOTAL: 9.44 PERCENT OF 900. TRAJECTORIES ASHORE ON NEWFOUNDLAND

OIL DISTRIBUTION PROBABILITIES FOR THE MONTH OF JULY



• REPRESENTS PROBABILITY LESS THAN ONE PERCENT

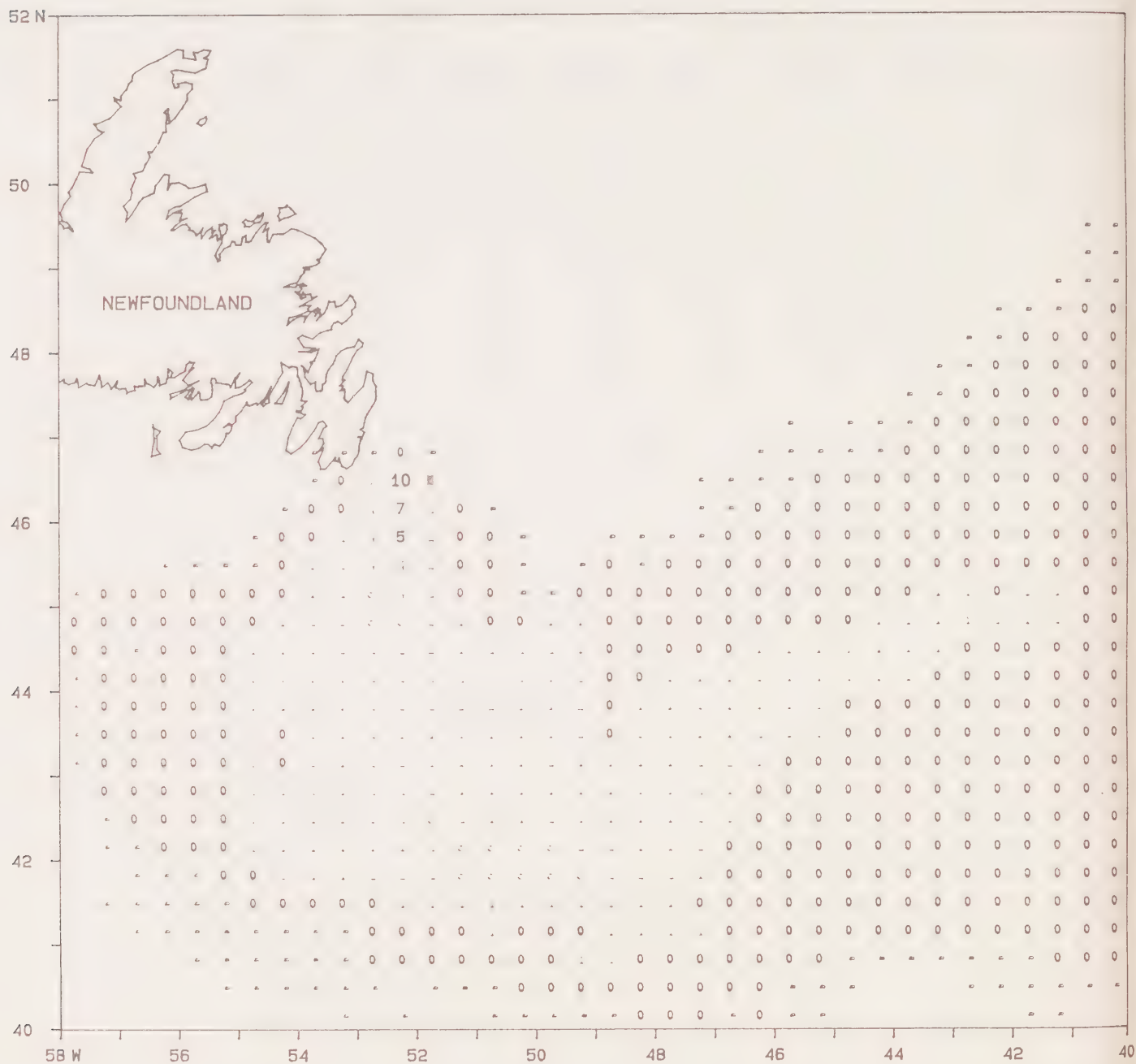
EPS TANKER SPILL

SHORE IMPACT STATISTICS FOR NEWFOUNDLAND FOR THE MONTH OF JULY

POSITION	PERCENT	MIN VOL.	MAX VOL.	MEAN VOL.	EARLIEST	LATEST	MEAN
ROW COL	IMPACTS	PER CENT	PER CENT	PERCENT	TIME (HR)	TIME (HR)	TIME (HR)
13 9	.22	15.	16.	16.	612.	636.	624.
13 10	.11	11.	11.	11.	1470.	1470.	1470.
15 10	.86	10.	20.	15.	666.	1104.	882.
15 13	.97	11.	22.	16.	654.	1260.	917.
15 14	.11	22.	22.	22.	504.	504.	504.
15 16	.11	21.	21.	21.	480.	480.	480.
16 24	.32	21.	23.	22.	162.	234.	202.
16 27	.22	21.	26.	23.	180.	186.	183.
16 28	.11	19.	19.	19.	240.	240.	240.
16 29	.22	23.	24.	23.	84.	162.	123.
16 30	.86	16.	27.	21.	72.	372.	155.

TOTAL: 4.09 PERCENT OF 930. TRAJECTORIES ASHORE ON NEWFOUNDLAND

OIL DISTRIBUTION PROBABILITIES FOR THE MONTH OF SEPT



• REPRESENTS PROBABILITY LESS THAN ONE PERCENT

EPS TANKER SPILL

SHORE IMPACT STATISTICS FOR NEWFOUNDLAND FOR THE MONTH OF SEPTEMBER

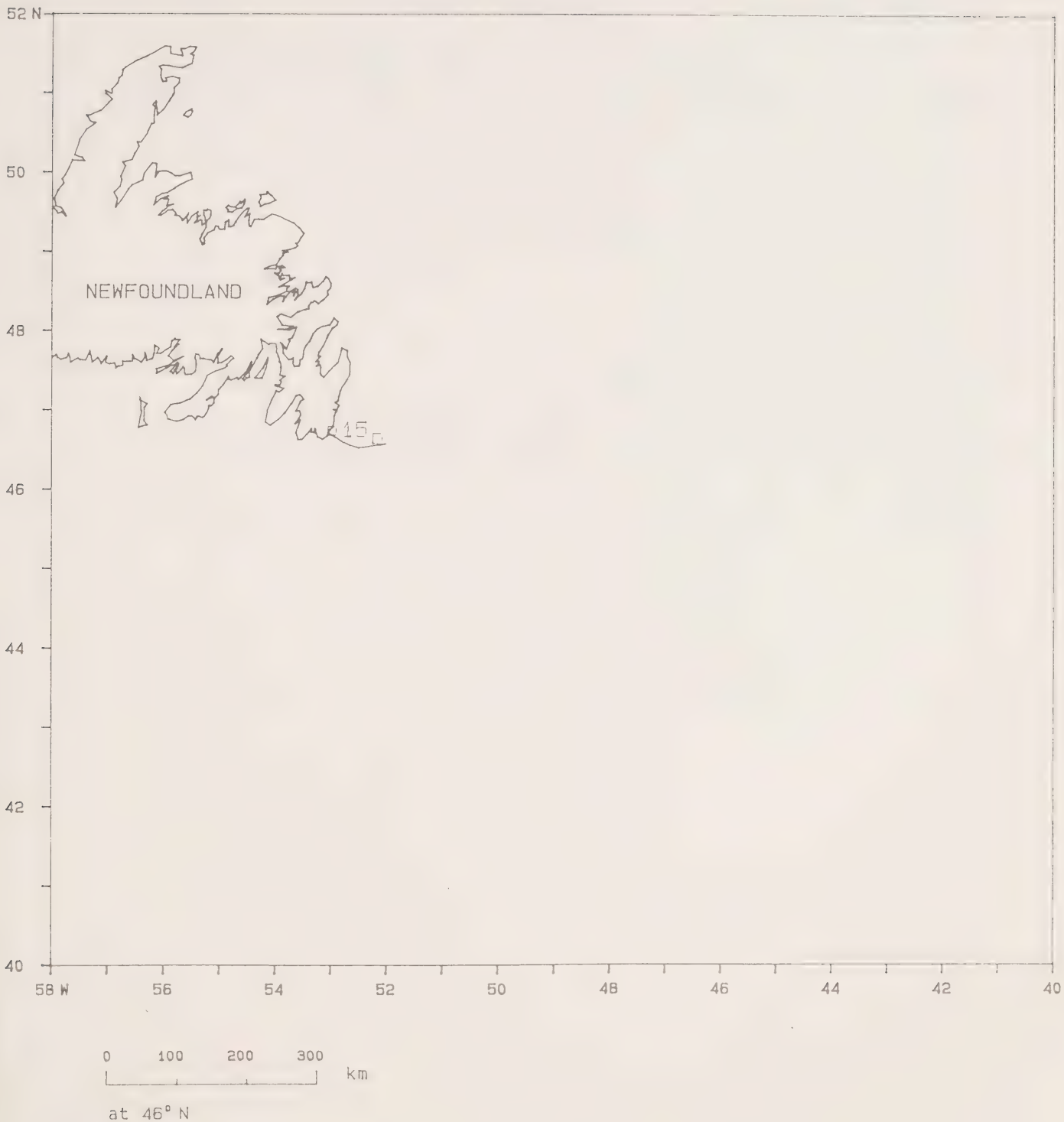
POSITION ROW	COL	PERCENT IMPACTS	MIN VOL. PER CENT	MAX VOL. PER CENT	MEAN VOL. PERCENT	EARLIEST TIME (HR)	LATEST TIME (HR)	MEAN TIME (HR)
16	27	.11	21.	21.	21.	90.	90.	90.
16	30	.11	24.	24.	24.	66.	66.	66.

TOTAL: .22 PERCENT OF 900. TRAJECTORIES ASHORE ON NEWFOUNDLAND

Monthly Worst Case Trajectories Plots
and Shore Impact Summaries

TANKER SPILL
WIND SOURCE:
CURRENT SOURCE:

JANUARY 15
1956
STANDARD DIRECTION
STANDARD SPEED



EPS

TANKER SPILL

SPILL BEGINS AT 0000 HRS, 15 JANUARY

WIND SOURCE: 1956.

CURRENT SOURCE: STANDARD DIRECTION WITH STANDARD SPEED

DAY	ROW	COL	END POSITION		LAT	LONG	ASHORE?	ELAPSED TIME HOURS	PATH LENGTH KM	MEAN SPEED KM/DAY	TIME C-14 HOURS	% AT ENDPT
			RANGE KM	BEARING DEG. T								
15	16	30	60.	293.	46.7120	53.0590	YES	30.	60.7	48.55	18.	31.4

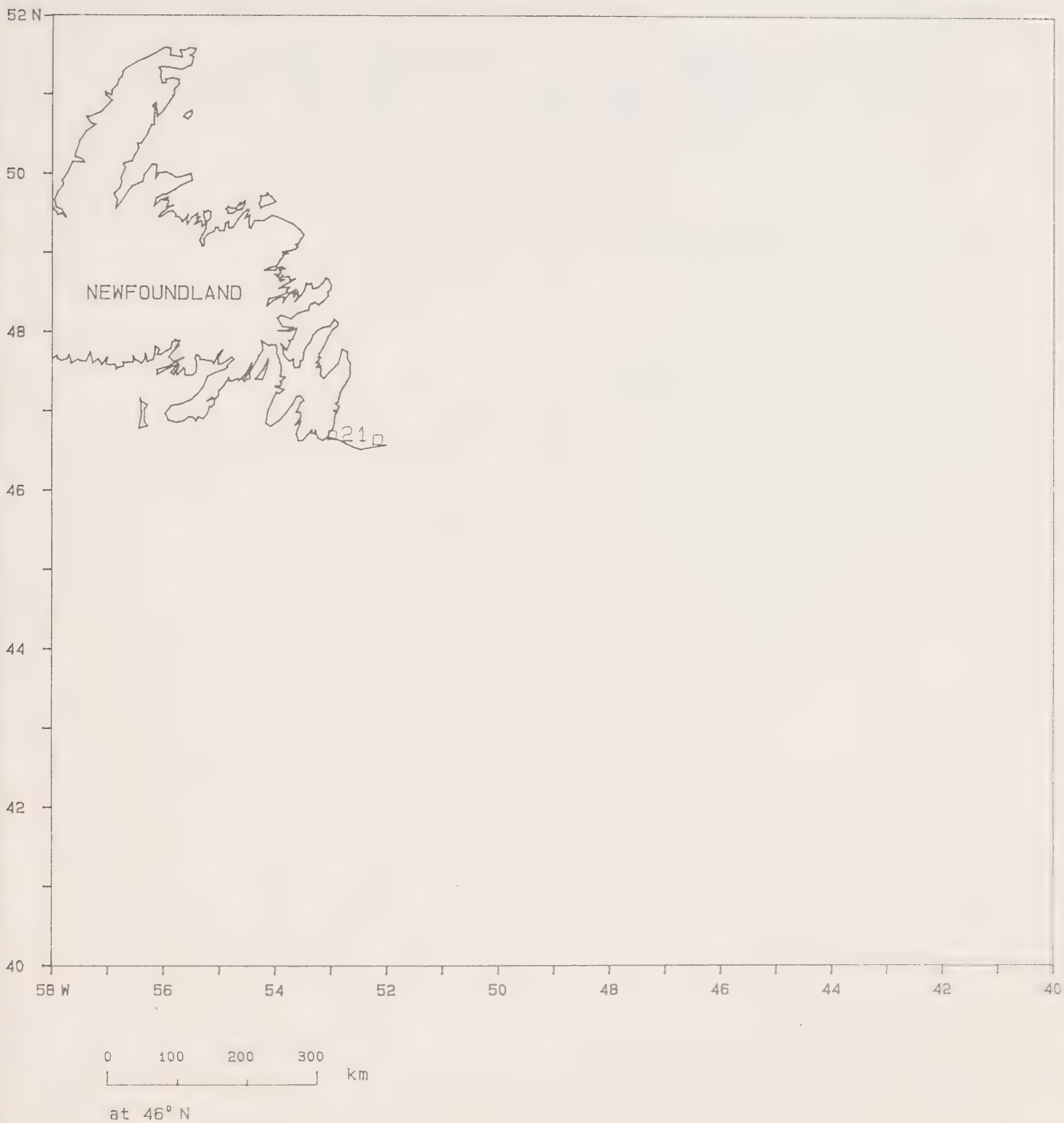
PERCENTAGE BAD WIND DIRECTION/WIND SPEED POINTS 0.00 0.00

SHORE IMPACT STATISTICS FOR: NEWFOUNDLAND

POSITION		NUMBER	MIN. VOL.	MAX. VOL.	MEAN VOL.	EARLIEST	LATEST	MEAN
ROW	COL	IMPACTS	PER CENT	PER CENT	PER CENT	TIME (HR)	TIME (HR)	TIME (HR)
16	30	1	31.	31.	31.	30.	0.	30.

TANKER SPILL
WIND SOURCE:
CURRENT SOURCE:

APRIL 21
1971
STANDARD DIRECTION
STANDARD SPEED



EPS

TANKER SPILL

SPILL BEGINS AT 0000 HRS, 21 APRIL

WIND SOURCE: 1971.

CURRENT SOURCE: STANDARD DIRECTION WITH STANDARD SPEED

DAY	ROW	COL	END POSITION		LAT	LONG	ASHORE?	ELAPSED TIME HOURS	PATH LENGTH KM	MEAN SPEED KM/DAY	TIME C-14 HOURS	% AT ENDPT
			RANGE	BEARING								
			KM	DEG. T								
21	16	30	59.	289.	46.6753	53.0556	YES	30.	58.9	47.11	18.	31.5

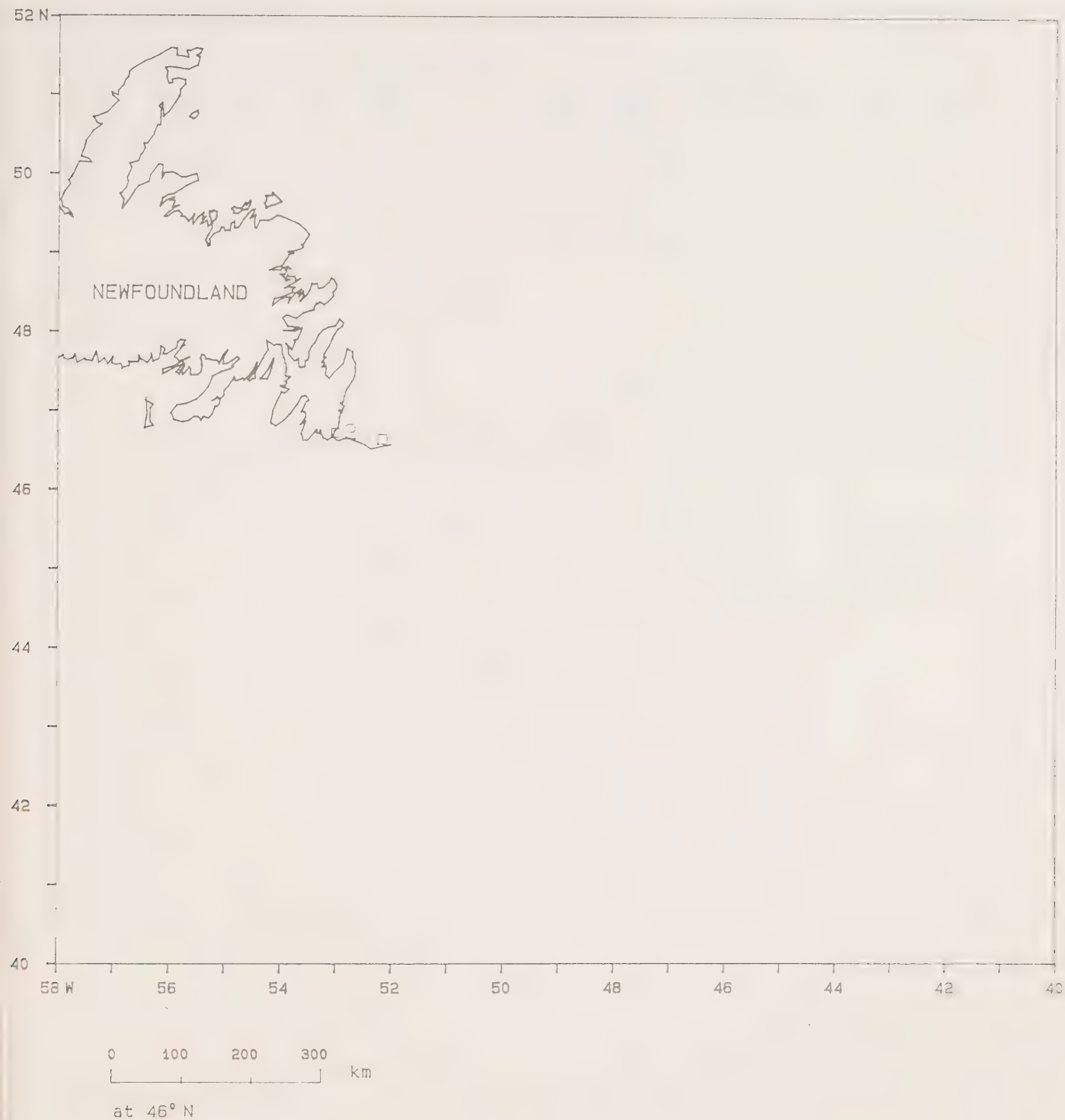
PERCENTAGE BAD WIND DIRECTION/WIND SPEED POINTS 0.00 0.00

SHORE IMPACT STATISTICS FOR: NEWFOUNDLAND

POSITION	NUMBER	MIN. VOL.	MAX. VOL.	MEAN VOL.	EARLIEST	LATEST	MEAN
ROW COL	IMPACTS	PER CENT	PER CENT	PER CENT	TIME (HR)	TIME (HR)	TIME (HR)
16 30	1	31.	31.	31.	30.	0.	30.

TANKER SPILL
WIND SOURCE:
CURRENT SOURCE:

JULY 2
1966
STANDARD DIRECTION
STANDARD SPEED



EPS

TANKER SPILL

SPILL BEGINS AT 0000 HRS, 2 JULY

WIND SOURCE: 1966.

CURRENT SOURCE: STANDARD DIRECTION WITH STANDARD SPEED

DAY	ROW	COL	END POSITION		LAT	LONG	ASHORE?	ELAPSED TIME HOURS	PATH LENGTH KM	MEAN SPEED KM/DAY	TIME C-14 HOURS	% AT ENDPT
			RANGE KM	BEARING DEG. T								
2	16	30	61.	291.	46.6983	53.0849	YES	72.	66.7	22.25	18.	25.0

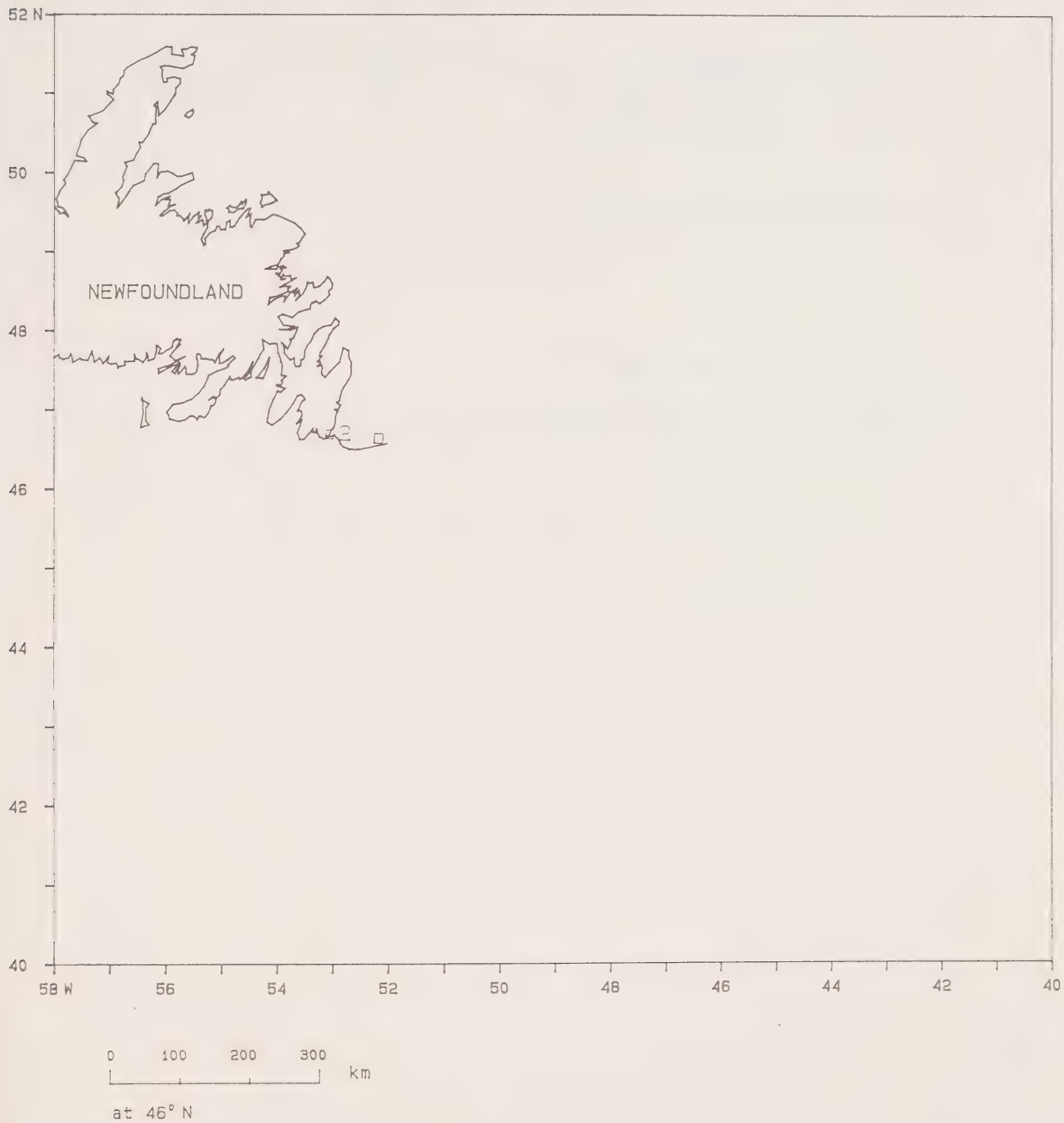
PERCENTAGE BAD WIND DIRECTION/WIND SPEED POINTS 0.00 0.00

SHORE IMPACT STATISTICS FOR: NEWFOUNDLAND

POSITION	NUMBER	MIN. VOL.	MAX. VOL.	MEAN VOL.	EARLIEST	LATEST	MEAN
ROW COL	IMPACTS	PER CENT	PER CENT	PER CENT	TIME (HR)	TIME (HR)	TIME (HR)
16 30	1	24.	24.	24.	72.	0.	72.

TANKER SPILL
WIND SOURCE:
CURRENT SOURCE:

SEPTEMBER 2
1975
STANDARD DIRECTION
STANDARD SPEED



EPS

TANKER SPILL

SPILL BEGINS AT 0000 HRS, 2 SEPTEMBER

WIND SOURCE: 1975.

CURRENT SOURCE: STANDARD DIRECTION WITH STANDARD SPEED

DAY	ROW	COL	END POSITION		LAT	LONG	ASHORE?	ELAPSED TIME HOURS	PATH LENGTH KM	MEAN SPEED KM/DAY	TIME C-14 HOURS	% AT ENDPT
			RANGE KM	BEARING DEG. T								
2	16	30	62.	287.	46.6682	53.1173	YES	66.	69.7	25.34	6.	24.3

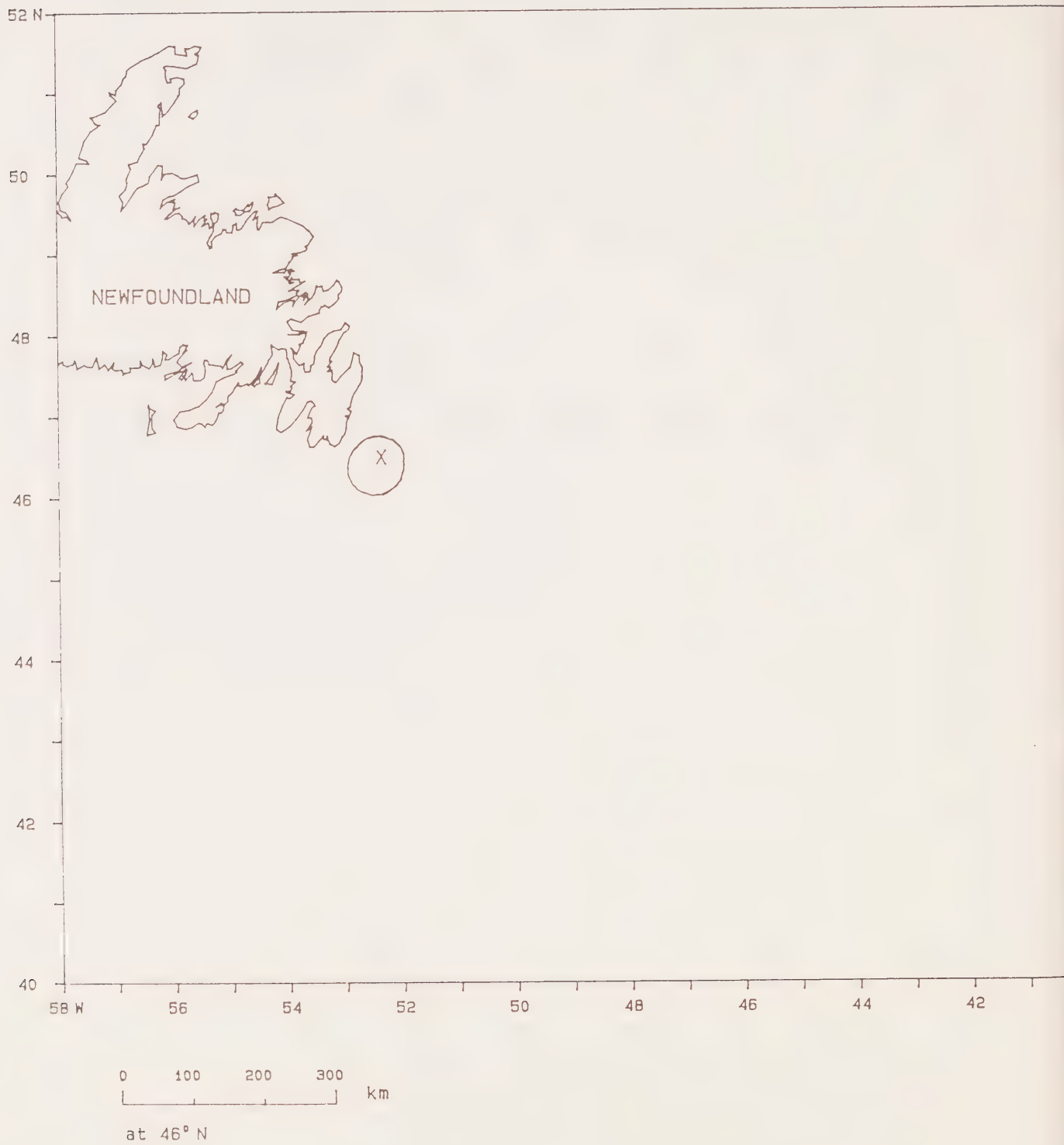
PERCENTAGE BAD WIND DIRECTION/WIND SPEED POINTS 0.00 0.00

SHORE IMPACT STATISTICS FOR: NEWFOUNDLAND

POSITION	NUMBER	MIN. VOL.	MAX. VOL.	MEAN VOL.	EARLIEST	LATEST	MEAN
ROW COL	IMPACTS	PER CENT	PER CENT	PER CENT	TIME (HR)	TIME (HR)	TIME (HR)
16 30	1	24.	24.	24.	66.	0.	66.

Extreme Envelope of Fractions Lighter Than C_{14}

TANKER SPILL C-14 ENVELOPE



ECONOMIC COMMENTRY
NUMBER 2

ON

MOBIL'S

HIBERNIA DEVELOPMENT

PROJECT

EIS BACKGROUND REPORTS

by

D. May

AUGUST 8, 1985

1.0 Introduction

Mobil's Environmental Impact Statement (EIS), enables governments, their associated management boards, and the general public to assess large projects still in the planning stage. The review of the EIS permits the community to take part in the "management" of the project and also permits governments, industry, community groups, and individuals to influence the impacts of the project. These groups can potentially enhance the benefits and reduce the negative impacts. The objective of this second Commentary is to assist these groups to better assess the economic impact of the proposed Hibernia development by providing comments on the Background Reports contained in Mobil's EIS.

The aim of Commentary number 2 is different from that of the initial one which examined the appropriateness of the economic approaches employed in Mobil's EIS in order to assess the impact of Hibernia development given the Federal and Provincial guidelines. The major conclusions of the first Commentary were as follows:

- 1) The general approach adopted by Mobil in its EIS seems to be Cost

Benefit Analysis (CBA). This is an appropriate approach since it provides decision-makers with a measure of the economic impact of the project on the well being of society. Unfortunately, only partial results are presented in Mobil's EIS in that the costs and benefits are identified but not **measured** as required in the Government guidelines. It was proposed in the first Commentary that a completed CBA on the alternative modes of development be presented.

2) The accepted CBA approach incorporates the technique of discounting which recognizes that individuals prefer benefits and costs now to some time in the distant future. It was suggested in the Commentary that not only current and constant dollar costs and benefits be presented but also that the corresponding "present values" be provided for each year in which the costs or benefits are likely to occur.

3) Geological variables are like future economic variables in that at this time both geological and economic variables cannot be known with certainty. These uncertainties generate a need for sensitivity and risk analysis. Briefly, sensitivity analysis would take alternative values of key

or strategic variables and examine the sensitivity of the estimated impacts to these assumptions. There is a very high risk, as has been established in statistical theory, with assigning a unique value to geological and economic unknowns such as the actual amount of oil in Hibernia and the economic uncertainty about the price of oil in the year 1991. For example, we do not know with certainty that there are exactly 800 million barrels of oil recoverable from Hibernia; there is a possibility that as much as 1.25 billion barrels or as little as 500 million barrels of oil might be recovered. Nor do we know with certainty that the price of oil will be \$28.18 U.S. in 1991 as has been assumed by Mobil. What would be the impact on the Newfoundland economy if the price of oil fell to \$20. U.S. a barrel? What would be the impact on local communities if, as happened elsewhere, more labour than is planned for were needed in the project development? The first Commentary suggested that risk and sensitivity analysis be carried out as an integral part of the Mobil EIS in order to allow proper management decision making.

4) It was also suggested in the first Commentary that resource rents

for the Hibernia project should be calculated subject to techniques of discounting and sensitivity and risk analysis as discussed in points (2) and (3) above. It should also be noted that a knowledge of the fiscal regime is not necessary in order to calculate the resource rents associated with Hibernia development.

This Commentary discusses the following points: **Section 2.0 Project Overview** -- geological variables, engineering specifications, and cost of the project, an examination of Atlantic Consulting Economists Limited - Volume 1. **Section 3.0 Industrial Impact Assessment**-- an examination of Atlantic Consulting Economists Limited - Volume 3. **Section 4.0 Labour Impact Assessment** -- an examination of Atlantic Consulting Economists Limited - Volume 4. **Section 5.0 Impact on the Wider (Macro) Economy** -- an examination of Informetrica's National and Provincial Macroeconomic Impacts of the Hibernia Development Project 1986-2005. **Section 6.0 Conclusions** -- concluding remarks tying this second Commentary with the first

Commentary

2.0 Project Overview

The Introduction of the Project Overview states, "This study is intended as a starting point for persons engaged in the assessment of the socio-economic impacts of the Hibernia project." The Overview begins with an estimate of the recoverable oil reserves which range between 80 and 130 million cubic metres (500 and 800 million barrels). We do not know which statistical levels of confidence were selected in order to arrive at these figures. Is the range at the 5 and 95 percent levels or the 10 and 90 percent probability levels? Further, we are not provided with the expected value of the recoverable reserves. Nor are we informed as to the reserve estimates associated with the production forecasts provided in Table 2-1. In addition, it is not clear why the production from the floating system would end in exactly the same year as the preferred fixed system since the cumulative amount extracted under the floating system is less than that for the fixed in 2006. In any event, since the concept of a **range** of

recoverable oil reserves has been introduced, the associated probabilities should also be provided along with the expected value of the reserves.

These values should then be extended to the daily production forecasts and on to the full field development costs etcetera. Alternative production estimates should have a fairly substantial influence on the macroeconomic impacts, including government revenues and expenditures. It should be noted that the optimal rates for daily oil production are determined by a rather complex process and it is not always the case that the depletion rates considered economically desirable by the operator will correspond to those rates deemed economically beneficial by society.

From an engineering point of view, there are a number of questions relating to the development alternatives, particularly the floating production system which is planned as a two stage development. It is not at all clear under what scenario a two stage development for the floating production system would be considered optimal. Mobil has assumed that the price of oil declines in real terms (1984 Cdn dollars) over the life of the project; the higher production rates associated with the floating

system after the year 2001 would therefore not increase the profitability of the operator. The proposal to test well productivity and the size of the reservoir at the end of the first stage suggests high geological risks associated with developing the field above certain recoverable reserve levels. Since probabilities are not introduced we do not know what these risks are. It is necessary to have some notion of these probabilities if we are to make any sense of the socio-economic impacts. For example, all of the impact analysis for the floating system assumes that the two stage development will occur with certainty if the project goes ahead. If in reality there is a possibility that the second stage will not go ahead then **all of the direct and indirect labour and industrial impacts associated with the floating system have been overestimated.**

The fixed production system comprises only one stage. However, in the scenario under which the second stage of the floating system is not justifiable, it is only logical to assume that the **operating** life of the fixed production system would be affected with a corresponding impact on industrial benefits, jobs, and resource rents. On this last point it can be

shown that the **resource rents would be substantially less for the fixed system** under this scenario. What would be the implications for the socio-economic impact if production were stopped before the date presently anticipated?

With regard to the shutting down of the oil field, the Summary of Mobil's EIS (p. 15), makes the following statement, "After production in the Hibernia Field has ceased, the Floating Production System could be used elsewhere." This statement raises the following questions. What is the engineering lifetime of a Floating Production System? What is the market value of the System and any other pieces of capital equipment at the end of production?

Although it is not discussed in Mobil's EIS there are conditions, those which are considered optimal for the fixed system, under which it would be desirable to have only one semisubmersible oil rig with production rates similar to those of the fixed. Typically, there are economics of scale and cost so that one large semisubmersible would not be nearly as expensive as two smaller production systems. Whether or not it is technically possible

to construct one large semisubmersible is an engineering issue and not an economic one.

It is generally assumed, in accordance with the desire of firms to maximize profits, that the technology chosen is a least cost one. Selection of the appropriate means of production, as far as Mobil is concerned, is based on the least cost method of producing oil. If a floating facility were to be used, and if it were built elsewhere, then the cost figures would be expected by some industry officials to be substantially less (about 60%) than the Canadian cost. Having the floating facility built elsewhere would also speed up the development schedule of Hibernia resulting in oil production beginning about a year ahead of the projected schedule. While the Canadian scenario would produce more jobs, the additional cost would imply a reduction in resource rents. **The underlying assumptions as to the least cost conditions should be clearly established for each activity in each mode of development.**

Closely related to the issues raised in the preceeding paragraph is the whole issue of how the cost estimates are derived. As is the case with all

of the socio economic impact analysis, cost estimates are fundamentally tied to the engineering quantity estimates. To the extent that engineering estimates are subject to these variations, variations will be reflected in all of the cost and certainly on the anticipated socio-economic impacts. We are provided with a glimpse of this technical variation in the discussion of the deck and topside facilities of the fixed production system. For example, on page 27 of the Project Overview we are told that, "The number of modules required is expected to range between 15 and 25..." Further on in the next paragraph the report states, "The weight of the completed topsides will range from 40,000 to 45,000 tonnes." While these ranges will have an impact on the cost estimates none of this comes through in the cost estimates presented on Table 6-3 which relate to the fixed production system. Prudence would dictate that ranges of cost estimates along with the appropriate statistical probabilities be provided for the cost estimates on Tables 6-1 to 6-4. An appropriate methodology would be to provide statistical estimates corresponding to a 95% confidence level.

In practice cost estimates should be calculated using, where

possible, the cost of projects developed elsewhere, such as the North Sea area. One such source of information would be North Sea Service published by Wood, McKenzie and Co.. Methods of estimates would then be adjusted to take account of **perceived** productivity differences and material cost differences. The point is that although one can construct a methodology to estimate the cost of development and production, the methodology and underlying assumptions made by Mobil Oil Canada, Ltd. and Atlantic Consulting Economists Limited are not known. It is therefore impossible to state whether or not the cost estimates are reasonable. The actual basis for determining the cost estimates should be provided by Mobil and the consultants.

It should be noted that assigning prices and making assumptions concerning productivity differences, including the time required to learn construction techniques, introduces further causes for variation in the cost estimates. The experience of the fabrication yard has to be taken into consideration since there is a learning curve associated with the building of the first four platforms. Any estimates of reasonable ranges for costs

along with the associated probabilities should acknowledge these sources of variation.

The costs provided in the Project Overview are the direct assignable costs associated with Hibernia development for the period past 1985. Not included in the costs are the potential social costs and the private overhead administrative costs. The social costs would include the environmental costs, additional health care costs, the value of human life in the event of a disaster, and the costs of the infrastructure needed to support the Hibernia development. Clearly there is a relationship between some of these costs and the engineering design of a particular mode of production.

In the critique of the Project Overview, I have raised some fundamental issues in trying to evaluate the potential socio-economic impacts from Hibernia development under the two alternative modes production. What are the statistical confidence intervals (or the means and standard deviations), associated with the geological, engineering, and cost variables? What is the probability that the second stage of the floating

system will not be required? What would early closure mean if the preferred field system were used? What underlying assumptions were made and what specific methodologies were used in order to derive the numerous cost estimates? All social and economic impacts are dependent upon engineering methods. The more detail we know about these, the more accurate our forecasts will be.

3.0 Industrial Impact Assessment

The engineering specifications as discussed in the Project Overview form the blueprints used by industry to build the production system which extracts the oil from the Hibernia Field, to temporarily store that oil, and then to transport the oil to market. Any variations in the engineering specifications will be transmitted as a source of variation in the industrial requirements. Once again this variation calls for a **range of estimates** with the associated probabilities of being within that range. As the engineering designs become more specific and detailed then the variation in industrial demands should decrease.

The Industrial Impact Assessment (IIA) is narrowly focused on only the **direct** impact of the development phase and the production activities. The economic impact on industry does not include the ongoing administrative operations of the partners of the Hibernia Field since the capital, labour, equipment, and materials associated with such operations would not be directly assignable to Hibernia. For example, Mobil's rental of the office building in St. John's would not be included as an industrial demand in this section of the EIS, because, it was assumed that those impacts would be picked up in the Macroeconomic Study.

In order to understand the direct, indirect, and induced industrial impacts, one has to think of two distinct phases, the development phase and the production phase. In each phase there are a number of activities outlined in IIA, Sections 2.1.3.1 and 2.1.3.2. In order to carry out a given activity a "production process" must take place. Often there will a number of firms involved. There are key elements to this production process which the consultants have identified as **materials, equipment, services, and contracting**. For the economist the service and contracting

components will include both capital and labour services. The **direct** industrial demands are related to the **demands** for each of these categories which I shall call inputs.

Each of the **inputs**, mentioned above, can be thought of as an **output** of some previous production process. For example, a local company may sell a piece of equipment which it imports from a manufacturing company in California. The local company may have a small work force, an office, and a storage shed. This local company's demand for labour is an **indirect labour demand**. The demand can be said to be indirect since the employees of this company are not directly involved in Hibernia development but they may be indirectly involved. In the same manner if the firm has to enlarge the storage shed because of Hibernia then this could be considered an indirect industrial impact. A little imagination will allow us to trace back the business linkages to the construction company and the lumber company which may be involved in the expansion. The purpose of this discussion is not only to familiarize the reader with concepts which are contained in the IIA but also to demonstrate the complex inter-industry linkages. These

linkages are usually not reflected in the income and expenditure accounts of the National Accounts. It is these two accounts (income and expenditure), which serve as a background to models such as TIM and RIM which are used by Informetrica to estimate the economy wide impact of Hibernia development. In the case of Hibernia somewhat more complicated accounts would be needed to capture the inter-provincial trade flows as well as the inter-industry flows. In the absence of these more detailed models there is a very high probability that both the indirect and direct labour, and related industrial impacts, will be mistated.

In order to estimate accurately the industrial impact it is necessary to indicate the impact for the four generic categories of goods and services: **materials, equipment, services, and contracting.** Ideally, the first two categories should be broken down by commodity classification. In order to provide business and government with the greatest opportunity for both Canadian and Newfoundland firms to participate in Hibernia development, as much detail as possible should be provided in the specifications. Unfortunately, we learn on page 14 of the

IIA that because development is only at the conceptual design stage, "Specifications regarding such features as size, grade, and quantity for materials, and capacity and operating characteristics of equipment are not available." Detailed specifications on equipment and materials for the floating production system are almost non-existent. Some detail is provided for the preferred fixed system but the quantity information is non-existent. For example, on page 34 we learn that we need pedestal cranes and hydraulic power units but we do not know the number. **Exactly what quantity estimates are available from the conceptual designs?**

Ideally, to acquire accurate data on the demand for materials and equipment it would be advisable to cross-classify activity modules with required materials and equipment, along with expected time and place of use of the equipment.

Since the demands are to be stated in terms of dollar expenditure, where expenditure is equal to price (cost per unit) multiplied by quantity, price data on equipment and materials must be provided. On page 13 of the

IIA the methodology for estimating expenditures for materials and equipment is spelled out. In the case of materials, if quantities are known then 1984 unit costs are used. What are these costs and where or how were they obtained? If quantities of materials are not known then "expenditures are estimated on the basis of experience with similar facilities or activities" (p14). Which facilities are these and what is the cost information?

The cost data discussed above introduces another element of stochastic (random) variation; this variation along with those associated with the engineering design and geological risk should be reflected in statistical confidence interval expenditure estimates in Tables 2.3-1 to 2.3-4.

Information presented in bar charts, such as Figure 2.3-2 of the IIA, should be presented elsewhere in dollars.

While previous sections dealt with the industrial demands arising out of the engineering specifications, Section 3 of the IIA examines the supply side, that is the ability of Canadian and Newfoundland businesses to meet

these demands. For reasons which the consultants give on the bottom of page 57 of their report, the supply side is weak. **Capability**, assessed at some time in the past, is based on questionnaires which have their own weaknesses. It is not possible to relate much of the information in 3.2.1.1 to information given earlier. We do not know, for example, what percentage of materials expenditures cast and forged steel valves represent. The implicit assumption of this analysis is that the productive capability of industry in Canada does not increase over time.

IIA recognizes that although Canadian industry might be capable of supplying materials or equipment there exists a possibility that they may not **participate** in the Hibernia development because they are not price competitive. Reasons for this lack of competitiveness are provided on page 63. But the all important effect of Canadian industry's inability to compete has not been provided. Information on Canada's inability to compete in this market is minimal, and is the subject of current investigation by economists. More often than not the reasons provided in IIA represent conjecture rather than hard analyses. The participation rates were either

subjectively derived from Mobil's worldwide experience or from "analyses carried out by consultants on behalf of Mobil" (p57). What analyses are these? Who are these consultants? There is not enough information provided to state whether the participation levels are reasonable or not.

Canadian and Newfoundland content ranges should be supplied for each category of industrial demand in each year of the development and for each demand scenario. If the basic information exists on a computer then requests for additional data can be accommodated with relative ease.

Section 4 of the IIA is on policy and is well written. Clearly a number of factors can influence the ability of Canadian industry to participate in offshore development. One such factor is the Mobil Hibernia EIS. The sooner business is aware of the detailed engineering design requirements then the more likely it is that Canadian companies will have a fair and full opportunity to become competitive.

Section 4.0 Labour Impact Assessment

This section attempts to assess the direct impact on labour markets

of Hibernia development at both the development and production stages. In the development phase the direct labour demands will arise out of the industrial requirements for contracting and services. The accuracy of the values assigned to the geological variables and engineering specifications together with the extent to which Canadian firms will be able to participate in the development will affect the direct labour demands. Statistical confidence intervals should be provided for the various labour categories. In the production phase direct demands on labour would include those directly concerned with the operation of the facilities.

The LIA report prepared by Atlantic Consulting Economists Limited does not deal with indirect labour demands arising out of Hibernia development, however, indirect labour demand is important. **Indirect labour demand** includes the "demand for labour generated in the off-site manufacture and supply of equipment and material inputs" (p.32). The workers involved in local firms which supply materials should be included but yet might not be, depending on the ability of Informetrica's regional impact model (RIM) to pick up these occurrences based on aggregate

historical data. The labour demands are not provided at the occupational level, but ideally they should be since increases in demands for those occupations in indirect labour demands could be in competition with the direct demands.

Induced labour demand "refers to the additional demand for labour generated in the Newfoundland and Canadian economies by successive rounds of spending direct and indirect labour income generated by the development" (LIA, p. 33). Actually, the definition should include all of the additional labour demands created as a result of spending successive rounds of factor incomes generated by the development. These factor incomes would not only include the wages and salaries of those involved directly with Hibernia but would also include the increased profits of local businessmen. The induced labour impact would also include the impact on the labour markets activated by governments spending of any increases in their revenues earned as a result of Hibernia development. Such revenue would include royalties, income and sales taxes. While Informetrica assumes that governments remove any potential impact by simply retiring

their debts, such actions can be considered as highly improbable. A much more likely scenario is that governments will continue to spend any increases in revenue in exactly the same manner as they have in the past. Depending on the size of the resource rents and the government take it is **possible to construct scenarios in which the impact on induced labour could result in far more jobs being created than the direct labour demand can accomplish.** For example the provincial government could spend its increased revenue on the construction of schools, roads, civic facilities, and social services. The regional impact would be quite different since it would be spread across the Province.

Despite the importance of indirect and induced labour demands in Newfoundland, these demands have received no attention in the LIA, which suggests (p.33), that an estimate of the indirect labour impact and a separate estimate of the induced labour impact are provided in the Informetrica study. In that study, however, there is only an estimate of the impact on employment in general. Because of the relatively large size and importance of the indirect and induced employment impacts these impacts

should be studied in much more occupational detail.

Common to all three types of labour demands, it can be said that, where the work takes place and **not** the residence of those who supply their labour is the geographic base of the labour demand. A certain number of employment opportunities will be created in Newfoundland, but it is unlikely that all of the positions will be filled by Newfoundlanders. For some of the occupations such as welders and fitters it is highly likely that few Newfoundlanders will fill these positions since few will have the qualifications or the experience, even though it can be said that the employment opportunity existed in Newfoundland.

There are types of labour that might be expected to be included as a labour impact that are excluded. For example, employees associated with the administrative structure of the oil companies will not be included in the impact even though they might be employed locally and working on Hibernia material. These people are not included because their work is not directly assignable to Hibernia development.

On page 34 of the LIA the methodology of estimating the labour

impacts by occupation is outlined. The consultants state that "the conventional factor approach is used." This factor is some measure of labour productivity. How were these labour productivity figures arrived at? Furthermore we are told that, "Factors are used to determine how aggregate labour content would be distributed." Presumably these are labour shares. How are these shares derived? In deriving jobs from person-years, aggregate requirements are related "to the schedule for the specific activity." Does this imply that all occupations within the aggregate work for exactly the same period of time? Figures D.4 and D.5 provide a brief glimpse of the manner in which variations in manpower requirements can occur in a project. The consultants have correctly pointed out that many of the jobs in the development phase last for only a few weeks or months. Tables which provide labour demands in numbers of persons should also provide the average duration of the jobs in terms of weeks. The request for this type of information does not remove the necessity of providing statistical confidence interval estimates for the various

occupational demands.

It is rather unusual to provide labour market information in **stock** terms since the concept of a market is consistent with a **flow** approach. Therefore we do not usually talk about the cumulative number of person years of employment. The process of simple summation assumes that society does not care if the job occurs in 1985 or 2005. Clearly, society will prefer jobs now rather than later, especially if the economy is experiencing high levels of unemployment.

Some of the figures extracted from the Canadian Occupational Projection System (COPS) model on page 101 are rather unusual. For example, in 1989 22.24% of all of the medics working in Canada will be employed working on the preferred fixed production system, and one Canadian labourer in twenty will be involved in construction work on the fixed system. Supply figures tend to be notoriously weak in the COPS model. In Table 4.3-1 we learn that there are 240 medics in Newfoundland in 1981 and only 90 employed in all of Canada. In that same year there are 2,790 persons involved in catering in the Province while there are only

1,425 employed in all of Canada.

Rather than focusing on the labour supply associated with all the individuals involved in a particular occupation within the economy, the supply figures selected deal with those individuals employed in six key industries. One would have thought that the skills of individuals outside these industries could be used in Hibernia development. How do the skills of telephone operators in the six key industries differ from those outside? Further, how were the supply figures in Table 4.3-7 derived?

In Section 4.3.2.5 it is stated that there is absolutely no chance of other oil fields being developed off the East Coast in the next 15 years. Is this a reasonable assumption in view of all of the drilling activity and the geological information gathered thus far?

One very critical piece of information is missing from all of the discussion of occupational labour markets in the LIA background report. What is the wage rate in each category?

Section 5 of the LIA, dealing with policy issues, is well written and is highly recommended reading for groups interested in the possibilities

for employment at the Provincial or local level. I shall end this section with a quotation from page 142 of the LIA, "In our view, the greatest impediment to planning for the changes which the Newfoundland economy can expect to undergo in the next decade is the lack of timely and specific information."

Section 5.0 National and Provincial Macroeconomic Impacts

It is difficult to evaluate much of the work carried out by Informetrica in their report on the macroeconomic impacts of Hibernia development since I do not have access to information concerning the specifications of the TIM and RIM models. I shall venture a few comments on the Informetrica report, but I suggest that the reader familiarize him/herself with the contents of that report.

Would it be possible to obtain the input-output commodities by province of anticipated purchase as was provided to Informetrica by Atlantic Consulting Economists Limited? Why was the "base case" not rerun at the time of the impact cases? Might the Hibernia impact be due to

changes in other economic variables which occurred between May 1984 and April 1985?

On page 9 of Informetrica's report we are presented with a number of assumptions some of which may be subject to change. The price of oil is assumed to be \$29 U.S./bbl in 1985. The Canadian dollar is assumed to remain fixed at \$0.80 U.S.. The rate of inflation in Canada is assumed to be above U.S. levels. How might these assumptions, which were made in the spring of 1984, be changed if they were made to-day and what impact might they have on the estimates?

Also on page 9 we are provided with cost data on pipelines but only the Portland to Montreal Pipeline cost is relevant since the cost of tankers is included in the project.

On page 12 it is noted that oil surpluses were predicted in the base cases. Surpluses are also predicted in the impact cases which are contained in the Appendices.

Comparing the 1984 forecasts with what has actually occurred demonstrates the difficulties involved in making forecasts and emphasizes

the need for sensitivity analysis.

In the Appendices a fiscal regime was assumed in order to estimate the impact on government balances. What tax rates were assumed? While it seems slightly unusual to do so, any cumulative impacts must be converted into present value terms. The impacts should be calculated assuming that the Government, at least at the Provincial level, uses its balances to stimulate the economy. In examining the impacts it is difficult to explain why the multipliers are so low and why the effect of Hibernia development may result in a decrease in real output in the economy in the early 1990's. The employment impacts include the direct impacts as well as the indirect and induced impacts.

The macroeconomic impacts contained in the Informetrica report are probably affected by a number of assumptions that seemed reasonable in the spring of 1984 but seem less reasonable in the summer of 1985. As noted earlier the indirect and induced impacts can be extremely important and probably greater than the direct impacts. In the absence of government spending the indirect and induced impacts will occur in the same

geographic locations as the direct. For Hibernia the greatest impact will be on the Avalon Peninsula. Given the importance of these effects they are probably not well represented by models such as RIM or TIM. A purpose built Provincial model developed around the oil sector would be superior. Such models are only worth constructing if one feels that oil development involves a number of oil fields.

Section 6.0 Conclusions

An in-depth review of the background reports has produced comments similar to those of the first Commentary. The economic analysis is often deficient in that projected values are cumulated without being converted to present values. Great risk is introduced to a variety of people, ranging from the economic planner to an unemployed person looking for a new career path in the offshore, because of the report's failure to give a range of values and the likelihood of events falling within the stated range. The methods used for calculating costs are often vague and so are industrial and occupational demands. Data integrity must be accepted as a matter of

faith. Independent verification is not possible. Finally, the scope of the impacts has been primarily focused on the private direct costs and benefits. The proper measurement of the wider social costs and benefits remains to be presented by Mobil.

Future public reviews as well as public planning would benefit greatly if the progress of Hibernia were monitored on a monthly basis. Such information could be easily stored and analysed on a computer model. Not only should the direct impacts be monitored but a far greater emphasis could be placed on the indirect and induced impacts.

The EIS itself represents a strong tool for the enhancement of benefits and the reduction of costs by the information which it provides. **A semi-annual update of the data in the background reports would provide a barometer of upcoming activity to local business permitting it the opportunity to derive greater benefit from the development of Hibernia.** As noted earlier, the sooner more information about specific demands can be provided then the greater is the chance that Newfoundlanders and Canadians will have a fair opportunity to participate

in the offshore development.

CRITIQUE OF THE
HIBERNIA DEVELOPMENT PROJECT
ENVIRONMENTAL IMPACT STATEMENT
ON
ASSESSMENT OF SOCIAL IMPACTS

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Introduction

The Governments of Canada and Newfoundland established a joint six person panel--the Hibernia Environmental Assessment Panel--to review Mobil Oil's proposal to produce oil from its Hibernia field on the Grand Banks of Newfoundland. Included in the mandate of this panel is the review of background documents and studies which comprise the Environment Impact Statement (EIS) conducted by Mobil in preparation for oil development. To assist the panel eight technical experts were appointed; they represent particular areas of expertise relevant to various aspects of the background studies and the implications of the proposed development in terms of environmental impact.

The writers of this critique were selected for their expertise in the area of socio-environmental impacts. In the preparation of this critique the four volumes prepared by Mobil comprising the EIS were reviewed with particular study and attention given to Volume IV, Socio-Economic Assessment, and its supporting consultant studies. In addition to attending one hearing, all of the transcription documents resulting from public meetings were reviewed.

In this critique of the Hibernia Development Project EIS Socio-Economic Impact Assessment it is our intention to discuss what the Assessment accomplishes and for what purposes it is useful as well as what it does not do. We do not intend to list deficiencies that might be corrected in a revised Assessment. Instead, on the basis of the Assessment and of the public hearings to date, we recommend measures that should be taken as a condition for approving the project.

One approach to the Assessment would be to ask if it complies with the "Guidelines for the preparation of an Environmental Impact Statement" in providing a comparison between what exists now and what could happen if the project proceeds...(and)... "the measures (the proponent) intends to take to contract or reduce those impacts."

However, having considering the content of the Assessment, we conclude that the public interest would not be served by the supplementation of information. Rather than addressing detailed questions of compliance and deficiency, we choose to discuss the implications of the Assessment and of the public hearings for preventing and mitigating the social costs of the project. In our judgement, this approach will be of more use to the panel and to the public than addressing the questions of compliance and deficiency.

The EIS Hearing Process

We feel that as part of the social impact assessment, we should document criticism of the EIS process. It is questionable whether the process allows informed citizen participation and response. Several factors diminish meaningful citizen participation.

1. Time - The time allowed for citizens to formulate and support their reactions is too short, especially considering the lead time given to the proponents.
2. Timing - The meetings were not held with local constraints in mind. For example, fishermen could not fully participate during the peak periods of the fishing season.
3. No funding of expertise.
4. The process does not facilitate participation. Participation is expected. Given the limited experience of most of the population with such processes, participation must be fostered and communities prepared for it.

Given these drawbacks, one cannot expect the average citizen, especially one interested in securing employment, to understand the implications of the EIS documents for his or her long term well-being.

General Observations on the Assessment

In general, the Assessment has a tendency to minimize impacts and concerns. There are no data in the Assessment on a number of possible impacts, and the reasons for their absence is not explained. Also, the Assessment and the responses of Mobil during the hearing to social concerns have some inherent weaknesses.

The proponants imply that acceptance of the plan can be based upon the kind of trust relationship that possibly could exist between two individuals with problems to be solved through mitigative actions such as monitoring, consultation with ad hoc committees and further study. Policy with respect to responsibility for financing and formulating programs and for administering them must be based upon legal commitments--either legislative or contractual. The Assessment makes no allusion to the need for such binding commitments except for reference to existing governmental responsibilities.

What information does the Assessment provide with respect to possible social impacts? Basically, it provides tentative data on employment. Such data will become more accurate once the realities of the GBS (now selected) are encountered. The Assessment also provides some demographic data and projections for the province and for areas presumably to be maximally impacted. It also provides basic information on existing social services, primarily manpower and types of services in selected geographical areas.

The Assessment does not provide information on existing social problems--poverty, alcoholism, illiteracy, sexually transmitted diseases, vehicular and non-occupational accidents, inadequate housing,

crime, child abuse and neglect, and lack of day care; nor does it predict changes in rates that might be attributable to development.

The document is, therefore, not useful as a basis for planning. The "hardest" data potentially are those on employment and to be useful they should be accurate and available well in advance of actual hiring activities.

The document is also not useful to the average citizen, for, not knowing future government policy, the citizen must accept on faith that already deficient services will be enhanced to prevent and mitigate effectively an almost certain rise in undesirable social problems.

What do we learn from the Assessment and hearings?

1. Estimates and projections are tentative and are contingent on the evolution of specific development plans. Presumably the proponent will inform the government at least of the employment implications of these plans as they evolve.
2. Aside from the principle areas of industrial activity, Come By Chance, Placentia, and St. John's, communities that may be deeply affected (both positively and negatively) from contractors' activities cannot be designated at this time, and the lead time a community would be given for preparation is unknown.
3. There are existing deficits in most social services and possible problems in school capacities and in public health services. Acute and chronic services appear well organized provincially and were recently the subject of a Royal Commission.

4. Most communities are not formally organized with full time paid staff with training and experience to work on community planning and development with the exception of Rural Development Associations.
5. The "monitoring" that is proposed consists of information on hiring and economic development which the proponent will provide and discuss with the government and with representatives of local communities.

What are the social risks of approving the project on the basis of the Assessment? The basic risks are that the province will not be prepared to provide preventative and ameliorative services to affected populations when they are needed. "Service lag" was a major problem in Alberta where development outpaced the social service (governmental and voluntary non-profit) agencies' capacity to prevent or respond to problems in particular populations. The danger then is that some individuals and populations will bear the social and economic costs of development while others enjoy the benefits. The purpose of the Assessment is to minimize such inequity while increasing benefits and minimizing costs generally. The proposed mitigation efforts in our opinion are not likely to produce these desired consequences.

Even if one assumed that after approval of the project the oil companies and contractors would incur major costs to adopt alternatives that would benefit communities, an infrastructure that would enable the communities to optimize their own interests would have

to be organized and nurtured. The deficiencies to be overcome are many.

1. Absence of local expertise or access to expertise.
2. Absence of funds.
3. Absence of formal organization with mandate, authority and sanctions to represent the spectrum of community interests, make agreements and assure compliance with them.
4. Absence of technical information or access to proprietary information that is necessary to decision-making (e.g., hazardous material storage and transportation).
5. Competition among communities vying for much needed economic benefits.

The proposed ad hoc system of companies and contractors consulting with committees is inappropriate and would certainly not serve community interests, particularly those of the disadvantaged, under these conditions.

General Recommendations

It is possible, also, on the basis of the information learned from the Assessment and the hearings, to make recommendations regarding general conditions for approving the proposal.

RECOMMENDATION: Social impacts should be projected for the province as a whole rather than for specific communities.

RATIONALE: Estimates and projections are more reliable for large populations than for the sum of several small ones. Furthermore, many potentially affected communities cannot be predicted at this time. Since most social services are administered by organizations with headquarters in St. John's, it is reasonable to prepare programs, manpower, and resources in terms of likely maximal need for the province and to allocate them to specific geographic areas as specific needs are foreseen.

RECOMMENDATION: Negative social impacts should be maximally estimated, not minimally. The service sectors of health and social services agencies should be prepared to manage "the worst case".

RATIONALE: Benefits ensuing from the project should at least cover the costs of negative consequences. Many of the workers will be young men, often living away from home in work camps or community large distances. This population is particularly at risk for alcohol abuse, risk taking with ensuing accidents, promiscuous sexual activity, conflicts with the law, etc. Therefore, any projections of impact should be on the basis of age and sex specific populations, not on the basis of projected increases for "normal" populations.

The public could well benefit from an improvement in services, many of which are at present deficient, even if "the worst case" does not ensue. Recreational facilities, for example, would benefit the population in any case. The same applies to day care, alcoholism treatment, etc.

In other words, for the province as a whole, planners should take into account maximal employment with maximal population growth impact and maximal social problem impact. It is these figures that should be used for estimating financial costs.

RECOMMENDATION: The province should commit funds to a governing interdepartmental body with regional representation with the authority to allocate funds to particular departments and agencies to prepare programs and train personnel.

RATIONALE: Without a commitment of funds (presumably to be derived from oil or related activities) other priorities (profit, roads, etc.) will supercede the need to prepare adequately for negative social effects. It is the responsibility of government to procure and provide the funds. It is the responsibility of the panel to ensure that a commitment is made prior to approval of the project.

RECOMMENDATION: Representatives from affected communities should be appointed to negotiate plans jointly with the governing interdepartmental body.

RATIONALE: It is unrealistic to suppose that small communities in competition with one another for economic activities and employment opportunities and often without full time paid personnel to work

on development are in a position to negotiate directly with large companies and succeed in protecting their interests.

It is inconceivable that once the project is approved, any company will incur significant costs for humanitarian reasons. Companies are in business to make money and aside from legal contractual agreements or laws negotiated prior to the approval of the plan, it is unlikely that the public relations personnel of a company will be empowered to do little more than abate nuisances--if the alternatives are not costly.

Assuming that the interdepartmental body has resources and that it is also in communication with companies regarding their development plans, it is reasonable that communities enlist the aid of the interdepartmental body in planning and in consulting with companies in considering alternatives and in abating nuisances.

The preceding recommendations make several assumptions:

1. That it is possible at least grossly to forecast and anticipate social problems.
2. That there is existing knowledge and technology for preventing or mitigating these problems.
3. That a system of services must be in place prior to the emergence of problems.
4. That while monitoring can enable a system to allocate resources among alternatives already considered (if proper indicators have been used) it does not help in designing alternatives.

The system must be ready to respond. An adequate monitoring

system will indicate only where and when the conditions exist for activity in already existing mechanism.

In view of these points, the proposed monitoring effort (which aside from development plans and hiring plans should be provincially planned and organized) is necessary but insufficient in itself to protect the public.

Social Services

Several areas require special attention: social services, housing, work camps and employment policies. Social services in Newfoundland are provided by a combination of government and voluntary community based organizations. Larger centres such as St. John's, Corner Brook, Harbour Grace, Grand Falls, and Happy Valley-Goose Bay have a broad range of services serving a spectrum of psycho-social needs. Other areas in the province, while provided with basic social services, do not have the resources to address social problems except at a very minimal level. The EIS studies are accurate in their assessment in stating that "most services are already overextended..." and characterized by "limited funding and staffing, and little overall planning" (Vol. IV, 1985, p. 299).

While it is not the intention to give undue attention to deficiencies in the present social service system it is necessary to point out that serious inadequacies do exist. These inadequacies are largely due to lack of funding, related to Newfoundland's difficulty in attaining some measure of financial stability. With an already existing high cost of living the problems in this area can only increase with oil development. Inflation continues to plague the Newfoundland economy. With an increase in demand, the cost for goods and services of most basic commodities will continue to increase. Particularly vulnerable will be those residents of the province who subsist on fixed incomes. These include the elderly, unemployed, single parents, recipients of social assistance who are unemployable, and disabled persons. As populations at risk,

they will require special services and resources to minimize negative impact of development. Existing incomes will need to be supplemented to prevent further deterioration in what may be viewed by many as their marginal status.

The EIS studies point out that expanded and additional social services will be needed to accommodate existing and future demands (Vol. IV, p. 299). Needs assessments have not been done in the areas most likely to be affected by development. Given the present minimal levels of social service provision, it is apparent that existing problems will be compounded.

Some of the most obvious areas of concern and need are:

- Emergency housing
- Marriage and family stress
- Sexually transmitted diseases
- Alcohol and drug abuse
- Unplanned pregnancies
- Recreation
- Crime and delinquency
- Day-care services
- Home support services, i.e. homemakers
- Child abuse and neglect

The EIS studies acknowledge the problems of accurate prediction of social impacts associated with development, and the nature of future demand for social services. In each instance where they do make tentative projections there is a tendency to minimize or downplay the impact. While their statements in this regard may

be viewed as optimistic, they cannot be accepted with any degree of confidence in a social situation such as Newfoundland where social services are already stretched beyond levels of what is seen as minimally acceptable. It is government's responsibility to act with measures that will rectify current inadequacies and further to be prepared to respond to the most pessimistic of future scenarios.

Housing

RECOMMENDATION: Total additional housing needs for the province should be estimated and the Newfoundland and Labrador Housing Corporation devise policies that ensure that these will be available where and when needed.

RATIONALE: The Assessment states that "the provision of both rental and owner occupied housing for Newfoundlanders is the combined responsibility of the housing industry and government agencies" (Vol. IV, 1985, p. 337). The housing industry is an aggregate of companies with responsibility for making a profit. This aggregate has no responsibility to provide housing. Companies and individuals must be assured that their activities are profitable and that risks are minimal. Given existing conditions and the proposed project and mitigative measures, risks to most builders are probably unacceptable.

Assuming that housing should be provided within reasonable commuting distance of place of employment, what will ensure that this will happen? In terms only of the provision of shelter, labor camps are a solution. Who is to live in them? Will individuals have a choice of what incentives will influence selection? Presumably only individuals (as opposed to families) will live in the camps. Those who wish to live with their families and do not have housing must buy or rent.

The Assessment assumes that most families will buy housing. Since the construction phase of the project is only a few years in duration, the risks in buying are great. The experience at Labrador

City and Calgary must have made a number of people leery of purchase, especially if rental is an alternative.

Whether contractors will risk building for either sale or rental given the short term in which to realize profits is empirical question that requires assessment, negotiation, and the formulation of policies to decrease risk.

Specific attention must be given to social housing, emergency housing for needy speculative in-migrants, and to protecting low income people who own their houses. This latter category requires special attention. It is highly likely that many Newfoundlanders subsist because they do not pay property tax. In most of North America, inflation of house values and rising taxes have resulted in marginal income people losing their homes or have necessitated special legislation to protect the poor and the elderly.

Work Camps

RECOMMENDATION: That the provincial interdepartmental body give special consideration to the provision of services to communities in proximity to working camps.

RATIONALE: Camps are a solution to the problem of shelter but they pose problems of their own. While the Assessment and the Mobil representatives at hearings minimize the negative effects of work camps, there is reason to prepare for special problems. In the Assessment and in the hearings the proponent repeatedly asserted that there have been no significant problems associated with work camps. In some instances, these conclusions are based on retrospective studies of conditions decades ago. Also, military camps make poor comparisons. The Argentia base was a self-contained city with men under discipline both on and off base. They also had amenities and events in which local people could participate that were unavailable outside the base.

The proposed work camps have legal control over their residents only while in the camp. Furthermore, they are to be in close proximity to communities. They cannot be isolated and it is unrealistic to assume that work fatigue will obviate all problems. The population of the camps will be largely male, younger and living alone. Problems with alcohol, drugs, driving, sex, and mental health must be prepared for. It is not sufficient to deal with these problems locally.

Employment Policies

RECOMMENDATIONS:

1. Extensive advertising throughout the province on the manpower needs of the company with detailed information on the types, categories, and estimated size of employment groups.

Such employment needs and projections should be made available to all interested parties as far in advance as possible. This is particularly important where training can be provided with sufficient lead time.
2. Where a Canada Manpower Office does not exist, recruitment activities should be brought to smaller communities through existing government offices, e.g. social services or development associations. In this way, equity in access to job opening can be developed.
3. In situations involving unionized contracting qualified resident applicants should be provided with the financial resources to ensure that their "union membership" is renewed. This will allow the "unemployed" with few resources to compete for available jobs.
4. Policies of affirmative action should be guaranteed particularly with respect to residents who are women. To date, there is little evidence that women have had an opportunity to compete successfully with their male counterparts. Problems associated with job access must be addressed.
5. Systematic planning should begin at once to ensure that programs of education and training are adequately preparing Newfoundlanders

for the jobs that are to become available. While this area is covered in the EIS studies, it cannot be overemphasized.

RATIONALE: Since Newfoundland has suffered for so long from high levels of unemployment, there is a tendency on the part of its citizens to view the prospect of jobs as the answer to "our problems". While there is a some measure of truth in employment being a means to solve many of our current difficulties, it can and often does raise false hopes for many. To ensure that the benefits of oil development optimally accrue to residents of the province it is imperative that formalized policies are in place prior to development. Areas of particular concern need to be reviewed.

The familiar theme throughout all the public information sessions was the concern that preference in hiring be given to Newfoundland residents. A typical response on the part of Mobil to this type of query was assurance that priority would be given to all qualified Newfoundlanders. While it is recognized that policies cannot be implemented that discriminate against Canadians from other provinces, some formalized agreements need to be in place that facilitate the recruitment and placement of Newfoundland residents.

Further Research

RECOMMENDATION: That the governmental interdepartmental body contract or sponsor studies and workshops specifically relating to formulating policy and program guidelines.

RATIONALE: An effective monitoring system must be under the control of those bodies charged with formulating and implementing policy. There are some areas that require investigation before effective policies can be devised and a monitoring system is essential to successful implementation of programs.

Several areas require special attention.

1. An evaluation of working camp experience with respect to devising policies for recreational facilities, public health and social services.
2. The problem of recreation and housing for the short term and approaches to providing continuity in the use of housing and recreation facilities.
3. Social services, facilities and arrangements for potentially separated or "intermittent spouse" families.
4. Experiences with "one industry" towns, especially during recession or discontinuance of activities.

OBSERVATIONS ON THE ENVIRONMENTAL IMPACT
STATEMENT - HIBERNIA DEVELOPMENT PROJECT
WITH REFERENCE TO OCEANOGRAPHIC FACTORS

by Wm. L. Ford

21 June 1985

My overall impression of this EIS is of an expertly prepared document well suited to providing the lay public with a persuasive perspective on the Project. For the technical reviewer, the development of the rationale is at times obscure even when one goes back to referenced contracted documentation. Nevertheless, the EIS presents in considerable detail the nature of the project and its environment, together with a wide ranging assessment of environmental impacts. It thus meets the objective of providing the public, lay and specialist, the opportunity to express concerns, identify loopholes and otherwise submit constructive suggestions. My specific observations follow.

Wave Climate

The wave climate is recognized as being one of the most significant environmental factors, if not the most significant, in the design, construction and operation of offshore facilities and hence in matters of environmental safety. The subject seems rather lightly dealt with in the EIS: p. 55, 57 and 64 Vol. IIIa. It appears that extreme wave design parameters are based principally

upon the study, Oceanweather Inc. (1982 a) without benefit of explanation in the EIS of any limitations it may possess. The tentative design maximum wave height, 100 year return period, is given as 30.5 m (p. 57, Vol. II). Oceanweather's hindcast produced a figure of 29.6 m. While the figure of 30.5 m is on the "safe" side, the logic for choosing it is not evident from the information provided.

A study, Wilson and Baird, 1984, done for the Royal Commission on the OCEAN RANGER Disaster, concluded that while the Oceanweather hindcast was the best undertaken to date covering the Hibernia area, it nevertheless had some limitations. Among its good features: inclusion of the ice edge and a finer grid in which the shoreline is well represented unlike other hindcast models. For two storms, the wave heights and periods provided by the model were in good agreement with measured values from wave recorders. However, other storms for which measurements were available were not hindcast to provide further verification of the model. Moreover, there is a substantial question about the storm selection procedure. Some storms used appear to be less severe than the one-year storm. Also, the study used storms for which the wave growth was fetch limited by the coast of Newfoundland and presumably by ice fields.

As of now there are 5 more years of storms from among which to choose and, for many of them, recorded wave measurements are available against which to check the hindcast model results. There are problems, however, with the measured wave data. The wave recording buoys which provide the measured data used to check the validity of hindcast storm waves are the widely used Waverider. Recently, Draper, 1984, has drawn attention to a quantitative analyses of the preferential loss of the more severe wave record by the Waverider. It would appear to be that the extreme conditions have to be estimated at about 16% higher than the actual record. This suggests that good agreement between a Waverider record of large waves and a hindcast means that the hindcast estimate is too low. This consideration does not appear to have been taken into account in wave climate studies for Hibernia.

The wind input for driving a spectral wave model is a critical factor in its reliability. Khanderkar & Eid, 1985 examine the problems of specifying the wind input for ocean wave models. They studied three storms over the northwest Atlantic. The substantial differences between observed and model winds were explained in terms of marine boundary layer dynamics. It would appear that this procedure applied to hindcasting, together with the longer data base of storms now available could lead to a refined estimate of extreme wave conditions at Hibernia and a higher level of confidence in values assigned to this important design parameter.

The EIS addresses the problems of wave grouping, episodic waves and wave breaking, p. 64, Vol. IIIa, by describing what they are and noting that not very much is known about them. There is no indication that any allowance is made for these not negligible events in the design criteria.

Extreme Currents

The estimate of extreme currents, e.g., the 100 year maximum, is in an unsatisfactory state because both the data and models are not good enough to do the job: Petrie 1982. In lieu, he suggests estimates based upon simple behaviour may be worthwhile. Without getting into the details, these procedures produced estimates of maximum near surface currents of 1.3 up to 2.4 m/s. Evans Hamilton, 1982, is quoted, p. 51, Vol. III, at 1.25 m/s. The EIS design criteria, p. 27, Vol. II, gives the figure of 2.0 m/s. It is not clear what the argument is for choosing 2.0 m/s nor what steps, if any, are being taken to improve the quality of the estimate.

Glacial Ice

The management of glacial ice is an unique feature of the Project and central to safety and good environmental practice. This is well recognized in the EIS and a considerable number of R & D programs are underway to achieve this goal. In Note 4, page 27, Vo. II, it is stated that all design criteria related to glacial ice are being re-evaluated. Considering the critical and unique problems

associated with the presence of icebergs, I suggest the Panel should reserve its position in this matter until the revision is completed and submitted to the Panel together with supporting documents.

Real-time Measurement of Oceanographic Conditions

On p. 109, Vol. II such real-time measurements are noted as being potentially useful during production operations. If this means being well informed about the immediate oceanographic environment, i.e., currents, temperature, salinity, density from top to bottom as well as internal waves, surface waves, through a process of continuously assessing the incoming data for its immediate applicability to operations, then Mobil is to be congratulated for a sophisticated step forward in environmental management. This approach to dealing with the marine environment wherein the "On scene commander" is meaningfully informed of the local here and now oceanographic conditions, much as he is about weather, should lead to more efficient and safer operations. It reduces the chances of being unable to intelligently respond to unexpected oceanographic events. That the ocean keeps coming up with surprises, often of a transient and highly energetic nature, is a measure of the relatively primitive state of oceanography and our inability to describe accurately the oceanographic climate of any given area.

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COMMENTS ON THE HIBERNIA ENVIRONMENTAL IMPACT STATEMENT,
WITH SPECIAL REFERENCE TO
MARINE MAMMALS AND BIRDS

Ian A. McLaren, PhD

2 July 1985

GENERAL COMMENTS ON MARINE BIOLOGICAL ASPECTS OF E.I.S.

The E.I.S. in Volumes IIIa and IIIb is quite hard-pressed to fulfill guidelines. Both the Federal and Newfoundland guidelines call for broad consideration of microorganisms, zooplankton, fishes, marine mammals, birds, and "ecosystems" (Federal) and "biological systems" (Newfoundland) in "all areas where environmental impacts might occur and not just at the sites of intensive development" (Newfoundland). The federal guidelines call for "judgement in selecting baseline environmental components likely to incur significant impact from the Project activities".

The Proponent has found it understandably difficult to practice judgement and has given each of the biological components similar weight. In Vol. IIIa 10 pages are given for marine plants and microbiota, 11 pages to zooplankton, 10 to benthos, 35 to fishes and fisheries, 21 to birds, and 10 to marine mammals. Yet in Vol. IIIb all of these components except seabirds are rated as having impact ratings of 0-1, those with ratings of 1 usually implying very local impact at most. Most marine biologists or biological oceanographers probably could have concluded this a priori. There are, however, some possibilities of sublethal effects on the life-history characteristics of key organisms like copepods (Cowles and Remillard 1983, who found marked reduction in egg viability after exposures to 20 ppb for 4 hr). Recent work on fish indicates synergistic impacts of low (but unspecified) levels of petroleum hydrocarbons and parasites (Khan et al. 1985). Although such subtle effects are not explored adequately in the E.I.S., it is possible that these are of more scientific than practical interest given the scale and concentrations resulting from chronic or catastrophic spills.

In general, however, it must be wondered why more effort was not put into components that are a priori more important. This is not to say that the extensive studies outlined in the background documents (MacLaren Plansearch Wildlife Study and the Biological Oceanography volumes) are not of intrinsic value. Ironically, they include the first seasonal surveys of phytoplankton and zooplankton on the Banks, and are being referred to by federal scientists for various purposes. Although I have found some errors of fact and interpretation in these documents, these are of little consequence in the context of potential impacts.

Another aspect of the broad-brush treatment that has been followed is in response to the (federal) guidelines requesting that the Proponent "describe the conditions in the vicinity of the development site in terms of inter-related ecological mechanisms and processes for the purposes of prediction . . .". This is responded to primarily in Vol. IIIa, p. 100-109. Apart from merely combining in an elementary way information that is treated under subsequent taxonomic sections, and giving a rather misleadingly simple summary on Fig. 3.2.1 and 3.2.2, this section includes tables ((3.2.1 and 3.2.2.) of feeding relationships among "important" components. The sources of information for this tabulation are not given, and not all seem to be obtainable from the background documents. One might wonder if it is important to know that herring eat Pagurus (a hermit crab, and a most unlikely food for herring) or that "Gulls" (species?) eat "insects", etc. However, possibly this section of the E.I.S. is a reasonable response to an impossible demand. A group of federal and other scientists is currently attempting to develop a "model" of the "Grand Banks Ecosystem" (Silvert 1985). There are disputes within this group on the scale and boundaries of such a system and on the proper division of components. Initially, they have been content to divide the biological components into very coarse (10-fold) length categories among "fish", "zooplankton", and "phytoplankton", with no use yet of information on

marine mammals or seabirds. There is no possibility of using the kinds of information on taxonomic categories and connections developed for the E.I.S. It is my conclusion that we are in no position to use ecosystem thinking in predicting or mitigating impacts on the Grand Banks, and the Panel should not be misled by demands from some quarters that such approaches be considered more fully, or in alternate ways, by the Proponent.

Thus we are left with the more sensible requirement to consider "significant ecosystem components" (Beanlands and Duinker 1984), among which are marine birds and mammals.

In considering the birds, I have had access to the response to the E.I.S. by the Canadian Wildlife Service, Atlantic Region, dated 4 June 1985 (hereafter quoted as "C.W.S. Response"). I agree with almost all the factual content and analysis in the C.W.S. Response, although here present my own views on the importance of perceived deficiencies and on other matters.

THE IMPORTANCE OF THE GRAND BANKS AVIFAUNA

Although the background Wildlife Study (MacLaren Plansearch 1981) does stress the ornithological importance of the Grand Banks on a world scale, this is (as note in the C.W.S. Response) somewhat dimmed by the piecemeal treatment of species in the E.I.S. It may be an exaggeration to suggest that the world population (5.5 M) of the Greater Shearwater (E.I.S., IIIa, p. 194; C.W.S. Response, p. 2) and the Northwest Greenland population (ca. 14 M?) of Dovekies (C.W.S. p. 2) all winter there. And the Wildlife Study estimate (from Piatt 1981) that 35-40 M seabirds use Newfoundland waters annually (not used in the E.I.S.) is merely a guesstimate. Nevertheless, these numbers do indicate the scale of useage of the Grand Banks by seabirds from many areas.

LIFE-HISTORY VULNERABILITY OF SEABIRDS

The E.I.S. (Vol.IIIa, p. 186-188) supplies comment and tabulation of population sizes and life-history characteristics of seabirds nesting in the Hibernia area, but does not make much of these data beyond noting that "their low annual reproductive rates are balanced by high natural adult survival rates. . ." It is true that life history data on seabirds are much better than those available for most bird species, but it is nevertheless very difficult to predict long-term effects of massive mortalities. An admirable attempt has been made to do this for Common Murres and Kittiwakes in the Bering Sea by Ford et al. (1982). This required massive amounts of information on the foraging habits, energetic characteristics, and life-history parameters of the colonies involved. This study could have relevance for a major spill near the Witless Bay colonies, but even then much more information would be required to be able to predict the effects on the adult birds and their dependent offspring (see Wiens et al. 1984). In principle the problem is simpler for a spill in offshore areas where (apart from Leach's Storm Petrels), the birds would not have dependent offspring. However, there is no solid information for any seabird on the nature of the density-dependent response to heavy mortality that would be required to predict the trajectory of population recovery.

That is to say, if a seabird population is assumed to be at equilibrium, with mortality and reproduction by definition in balance, a substantial decrease in its population size should lead to enhanced survival or reproductive rates, or both, so that the population recovers to its original, balanced state (assuming that the environment has not been permanently altered). (This view has been, until recently, virtually axiomatic in population biology, but is now increasingly in question in the ecological literature. If false, it raises much more serious consequences for long-term effects of catastrophic mortalities.)

Simply as a model of the situation, I present the following. As the Wildlife Study (MacLaren Plansearch 1981) notes, the Razorbill is the least abundant of the Atlantic alcids and appears to have declined in recent years. Its life-history parameters (for a British population, from Lloyd and Perrins 1977) are listed in the E.P.S. (Vol. IIIa, p. 188). Taking age of first breeding as 5 yr, reproductive success optimistically as 0.71 young fledged per pair per year (upper limit in the E.I.S.) and applying the adult survival rate of 0.9 (0.89-0.92 in the E.I.S.) to all birds of 1+ yr in age, it can readily be shown that the population will be in equilibrium if first-year survival is 44.3% (as opposed to 90% for older birds). Such high first-year mortalities have been widely demonstrated among birds. Let us further assume that if the population were very much reduced, first-year survival would approach that of older birds, and would decline in a linear fashion as the population approached its original equilibrium (this is the simplest possible sort of response to increasing population size). Then, if all age classes of this population were subject to massive mortalities, the times to recover to something like the original levels can be demonstrated as follows:

% of population killed	Time to recover to 90% of original level
25%	15 yr
50%	31 yr
75%	49 yr

It should be stressed that, although this model makes rather simple and arbitrary assumptions, most variations of it would produce similar results; the long times to recovery are a consequence of the very low reproductive rates of such species.

SEABIRD DISTRIBUTION IN RELATION TO POTENTIAL IMPACTS

Data on seasonal and geographical distributions within the study area are summarized in the E.I.S. (Vol. IIIa, Fig. 3.2.33 to 3.2.37). I agree with the C.W.S. Response that the maps lack an explicit statement that blank areas represent lack of surveys. However, I have more serious reservations about the use of such maps for planning or prediction.

The dimensions are birds per km, and thus do not give absolute densities of birds in the area. Although the aerial surveys carried out for the Proponent have been documented in the Wildlife Survey (MacLaren Plansearch 1981) they do not appear in the E.I.S. proper. Although limited in scope and not summarized in the most revealing way (as "inshore" and "offshore" densities, thus greatly grouped), these aerial surveys do seem to represent a lost opportunity to obtain at least first approximations of absolute densities. Even where size-related problems of bird visibility were involved (as implied in the Wildlife Study), estimates for large, conspicuous species could have been used to calibrate other, less visible forms.

The surveys also produced (documented in Wildlife Survey) information on the patchiness, and by implication group sizes, of seabirds. No such information is in the E.I.S. proper, although it could have been developed in the context of species vulnerabilities.

Finally, the aerial surveys produced data on the proportions of the different species that were flying or on the water. This information is not developed for the E.I.S., but surely could give more insights into vulnerabilities.

In general, I believe that the opportunity was lost to obtain much more useful information on seabird distributions and vulnerabilities. The PRIOP surveys (see Vol. IIIA, p. 192) coordinated by C.W.S. were designed for obtaining estimates of relative abundance of seabirds using ships of opportunity.

What is obviously needed are not merely absolute densities (in the manner supplied by the aerial surveys) but also turnover rates of birds in censused areas. These may be difficult to obtain, but it does seem that stationary rigs or support boats on station on the Grand Banks could have offered useful platforms for an effort in this direction. If we knew, for example, how many murres pass through a given patch of seawater (taking currents into account) per unit time, at various localities and seasons, we would have a more appropriate predictive tool than is supplied by the PRIROP surveys.

Similarly, the shipboard surveys at 10 and 20 km from the Witless Bay colonies (available in the Wildlife Report, but not the E.I.S. proper) could have been of much greater use if numbers per 10-min period could have been given as absolute densities. Then, along with information on feeding schedules (i.e. times spent at sea and at nests) available for most species (some work actually done at the Witless Bay sites) a clearer picture of actual vulnerabilities would have emerged.

NON-SPILL IMPACTS ON BIRDS

I agree with the conclusion in the E.I.S. that virtually all impacts not involving oil spills would have negligible consequences for seabirds at the population level. I have some reservations about the nature of produced-water hydrocarbons. It is not clear from my reading if the small maximal concentrations mentioned (15-400 mg/L) would be uniformly dispersed or appear in the form of occasional slicks or "blobs". If the latter, some of the dilution scenarios may be optimistic.

I have not considered the various impacts that could come with development of shore facilities, through colony disturbance, legal and illegal hunting, etc. Presumably such impacts would attend any sort of development in the region and be subject to planning and legal controls.

THE NATURE OF OIL IMPACTS ON SEABIRDS

As noted in the C.W.S. Response to the E.I.S., the effects of oil on seabirds are discussed rather summarily and confusingly in the E.I.S. (Vol. IIIb, p. 83).

First of all, it is now generally agreed that a bird ingesting oil by preening its feathers is probably already doomed. Recent studies (Rahimtula et al. 1985) suggest that the direct toxicity of ingested petroleum hydrocarbons to Newfoundland seabirds is quite low. It is true that the same source shows (as have others) that petroleum-coated eggs are severely impacted, and that vapours can be quite toxic to older birds. But, since vapours in such concentration and the carrying of substantial oil to eggs by seabirds would only occur when there was already massive oiling of adults, these toxic effects would appear to be of little additional importance.

The massively oiled bird illustrated in the E.I.S. (Vol. IIIb, p. 83) is exceptional. It is noted in the Wildlife Study (MacLaren Plansearch 1981) and in the C.W.S. Response that bird mortalities that have occurred with past oil spills have followed no predictable relationship with size of the spill. Even small, scattered "blobs" of oil can be devastating, as bird feathers are water-repelling, but oil-attracting. Death in cold waters (even in summer off Newfoundland) results from hypothermia and exhaustion of metabolic reserves, even from very localized breakdown of feather insulation.

OIL SPILL SCENARIOS AND SEABIRDS

All the impact ratings of 3 in the E.I.S. are for birds following oil spills from blowouts, storage, or tankers. I accept on faith the probabilities given (Vol. IIIb, p. 69) for occurrences of offshore oil spills, although wonder about extrapolations from relatively benign environments to Hibernia. Presumably

the Panel will have more expert advice on this.

Although the currently accepted properties of fresh Hibernia oil appear in the E.I.S. (Vol. IIIb, Table 4.7.2), the oil spill scenarios are I believe based on the less viscous, more soluble characteristics earlier attributed to this oil (cf. Table 4.2. in Ross 1984 with Table 4.7.2., Vol. IIIb, of the E.I.S.). Although Ross (1984, Appendix 2) claims that this difference "is not a major reversal since fresh 'Hibernia' oil may be present in only two of the twenty scenarios (the worst-case and average subsea blowouts where the gas is not ignited)" it is precisely these scenarios that would have the most appalling consequences for seabirds. The Panel may wish to press for more details on the presistence of coherent amounts of "real" Hibernia oil; I consider more on this below.

By contrast with the scant discussion of impact of oil on seabirds (Vol. IIIb, p. 83), the E.I.S. devotes three columns (Vol. IIIb, p. 83-84) to the possibility that oil could come ashore. While oil on shore has large impact on public perceptions, generally it is less damaging and more controllable there than at sea. Birds coming ashore in oil have already been damaged beyond recovery or killed at sea. The significance of oil in inshore waters is the much greater concentration and diversity of seabirds and waterfowl that can occur there. The statement (Vol. IIIb, p. 85) that "predicted impacts on seabirds are negligible for widely distributed shoreline species" is questionable if populations are migrating coastwise through a near-shore patch of oil.

I believe that the most important deficiency with respect to seabirds is the failure to come up with appropriate predictions for the distribution of oil on the sea surface. The models developed in Ross (1984) partly from work by Seaconsult (not seen by me) and inadequately summarized in the E.I.S. Vol. IIIb, deal with essentially two aspects: survival time of oil, and trajectories of spills.

The various arguments about long-term fates of released oil must be thought about carefully, and more expert opinion should be sought. However, it does appear that the potential for bird kills could be quite large, as substantial quantities of oil could remain for some time. From Ross (1984) it seems possible to glean the following. The analyses of trajectories, while of value in sketching the areas of concern, cannot be used to estimate probabilities of contact of birds and oil (even if we had good density estimates of birds -- see p. 3-4, above). As noted by Ross (1984, p. 172) "there is no implication that the envelope defined by all the trajectories of the worst-case scenarios should describe a region of sea surface which is totally covered with oil. Rather this envelope defines the region within which all oil from the spill would be expected to be found." But they are also unable to be at all precise about the amounts and distributions of oil that will be found through time within the envelope area. They find that the "area covered" after a blow-out of 25 days would be of the order of 1000 km² in winter for the "Avalon" oil (i.e., the general case), and much greater for other scenarios (but not calculable because earlier versions of "Hibernia" oil or "blends" were used for Fig. 4.18 and 4.19 in Ross 1984). These estimates do not include losses due to natural dispersion, but are said to be the actual areas covered by oil, not the envelope area for patches. Within these areas, in fact the oil might rarely if ever form a coherent slick, but remain as "pellets", not spreading below 10°C, forming stable emulsions at all temperatures, and "would form dense, nearly neutrally bouyant mats and lumps of emulsion that would submerge and float beneath the surface in turbulent waters." The oil is said at one point to be likely to behave like "bunker C". The discussion of natural dispersion in Ross (1984, p. 151-154) is complex and does not appear to be entirely appropriate to the Avalon (i.e. general) type of oil. The graphical results

presented in the E.I.S. (Vol. IIIb, Fig. 4.7.5-4.7.7.) are probably optimistic for the kind of oil that would actually be involved. The qualitative statements in Ross (1984) are probably just as informative: "unless very heavy seas prevail, these slicks prevail on the sea surface for one or more months" (p. 159) and a substantial fraction of the residual oil would probably form tar balls which "have near neutral bouancy and generally float beneath the water surface" (p. 163).

It would be of great value to the present and future developments if a more accurate picture of the distribution of bird-impacting oil could be developed. For a seabird landing on or swimming through the water, the probability of potentially lethal contact with oil may not differ much over a wide range of oil amounts: one 10 cc "blob" per square meter of surface may be just as effective as a continuous slick. We need an analysis of the time-dependent distribution in terms of numbers and sizes of even the smallest "blobs" within the affected area. When this is done, good data on seabird distributions, and perhaps experimental work on contact rates of birds and "blobs" and their consequences for morbidity, could all be combined with the appropriate measures of predicted distributions of oil, to give a truly predictive and planning capability.

GENERAL COMMENTS ON MARINE MAMMALS IN THE E.I.S.

The E.I.S. appears to give a reasonably accurate overview of the status of marine mammals in the area. As noted in the Wildlife Study (MacLaren Plansearch 1981) the shipboard and aerial surveys did not produce enough sightings for density estimates to be made. It can be asked if the geographical and seasonal summaries in the E.I.S. (Vol. IIIa, especially Figs. 3.2.29 and 3.2.30) and in the Wildlife Study (Fig. 26) reflect effort as much as real distributions. Some of the population estimates in Vol. IIIb (Table 3.2.30) are not up-to-date, and the classifications on Table B-5 of relative occurrences as either "rare" or "common" seem unduly coarse.

No information on life-history characteristics of Grand Banks sea mammals is offered, although it is these characteristics that make them vulnerable to added mortality, for the same reasons applying to the seabirds (see above, p. 2). However, as with the seabirds, it has to be admitted that, in spite of substantial information on the life-history parameters of seals and whales, it is not possible to predict long-term recovery patterns for populations subjected to major impacts. This is because the dependence of these parameters on population densities has not been well worked out for any species of marine mammal (McLaren and Smith 1985; Perrin et al. 1984 and review of this by McLaren 1985).

POTENTIAL IMPACTS ON MARINE MAMMALS

The E.I.S. documents the scarcity of seals in the area states, probably correctly, that there is "no documented evidence of whale mortalities due to oil". On these bases, it assigns an impact level of "nil" to seals and 0 to whales.

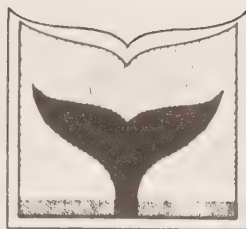
Some uneasiness has been expressed about the general effects on acoustically sensitive whales of noises from oil rigs and increased boat traffic. Recent studies of Bowhead Whales in the Beaufort Sea (Richardson et al. 1985) showed that the whales frequently reacted to aircraft at < 300 m altitude, and swam away from boats 1-4 km distant. They also appeared to show avoidance reactions to drillship noises. However, the possibly endangered Bowhead Whales are still being killed by aboriginal Alaskans, and might therefore be expected to be "skittish". Certainly east-coast whales appear to be much more approachable by motorized vessels.

Of course it remains possible that marine mammals could be impacted negatively on a small scale and in subtle ways. This uneasiness is expressed in a recent review by Hofman and Bonner (1985) who, while noting that "it may be

excessively costly or impossible to obtain the wide variety of data needed to predict reliably both the direct and indirect effects of disturbance and contamination that accompanies exploration and development", nevertheless conclude that "in the coming decade more effort will have to be devoted to the design and implementation of programs to detect, mitigate and monitor, as well as predict, both the direct and indirect effects of offshore oil and gas development". The Panel may perceive a certain wooliness in the construction of this dilemma.

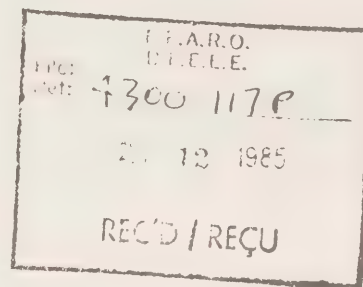
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August 1, 1985

Mr. P.J. Paradine
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Hull, Quebec K1A 0H3



Dear Phil:

I have now had time to look over the considerable material you have sent me on the Hibernia EIS. There is a tremendous amount there, and it does take some time to even develop an overview of it. As I have said to you in conversation, it is not altogether clear to me what my response, as a technical expert, should be to the panel. My thinking, however, was greatly helped by the Beanlands report on "An Ecological Framework ..." that you sent me. As I view it, the usefulness of an ecologist such as myself is going to be greatest during the public technical hearings in the Fall.

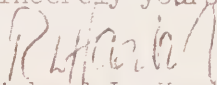
By and large, I think the "ecological" (or "basic biological" if you prefer) sections of the report are well done. There is an attempt, largely successful, to be as quantitative as possible, and also to give some idea of natural variation, a decidedly difficult matter within the time constraints of the study. Indeed, the only specific critique that I could offer would be to rephrase the generalities of the Beanlands report so they would apply to this EIS. Beyond these, I do not think that any serious but unconsidered ecological matters are likely to arise in further hearings.

An important part of Beanland's thesis is that continued monitoring is required as an integral part of the EIS process. I agree very much with this point of view. Inter-annual variation, particularly in apparently climate-controlled ecosystems such as that on the Grand Banks, must be quantified. During the short period of time devoted to the full scale study, only a guess can be made at this. Monitoring of selected components of the ecosystem should be continued for a goodly number of years. Just exactly what these components are must be decided through the stronger development of a conceptual framework. How the ecosystem is structured and what are the driving forces are questions to be resolved.

Ian MacLaren is going to provide you with some remarks on the seabird sections, I understand, but I have some remarks also. While the report did a fairly good job on the distribution and abundance (the kind of data that falls easily out of a systematic survey), the question of behaviour and association with oceanographic features may require more study. Seabirds are very fine integrators of the entire health of an ecosystem, situated as they are at the very top of the food chain, and this fact should be appreciated. Furthermore, aspects of their behaviour can result in their being much more susceptible to catastrophic circumstances than almost any other component of

the ecosystem. I think particularly of the fact that the great proportion of all the western North Atlantic common murre population is on the water (and cannot fly) in the vicinity of Fogo Island during the latter part of July. The chance of an oilspill encountering these vast flocks is very small indeed, but should one occur, the consequences would be absolutely devastating. Continued monitoring, some study, and particularly some modelling will probably be required on a continuing basis.

Sincerely yours,


Richard L. Haedrich
Director, NICOS

RLH/hr

COMMENTARY ON THE EFFECT OF ICE AND ICEBERGS ON
PRODUCTION OPERATIONS IN RELATION TO THE ENVIRONMENTAL
IMPACT STATEMENT FOR THE HIBERNIA DEVELOPMENT PROJECT

D. B. Muggeridge

August 7, 1985

St. John's, Newfoundland

TERM OF REFERENCE (SEA ICE AND ICEBERGS)

Guidelines for the Preparation of an Environmental Impact Statement for Potential Oil Production on the Northeast Grand Banks, Environmental Assessment Panel, Ottawa, Ontario, July 1980

QUOTE

6.4 Environmental Hazard Prediction Systems

Describe surveillance and prediction systems needed to provide adequate protection from weather, ice-bergs and sea-ice, sea-state and other environmental hazards and the manner in which these will be integrated with or will incorporate observing and predicting systems of the Federal Government.

7.3 Oceanography

- d) sea ice (including icebergs, bergybits and growlers); movements, characteristics of their occurrence, extremes, types, probability of critical or significant occurrences, which may effect operations, impacts and mitigation measures including regular and relief wells, oil spill counter-measures, stresses on structures, etc.
- e) ice scouring, with particular reference to the frequency and depth of scours and the relationship between water depth and scour distribution

8.2 Contingency Plans and Counter Measures

- c) discuss the threat of ice, and severe storms and other weather conditions to the production and transportation systems and describe the countermeasures and dangers involved. A clear statement of the configurations, procedures, minimum advance warning times and time for reconnection before operations can resume should be included in this section.

UNQUOTE

Guidelines for the Approval of a Hibernia Development Program, Newfoundland and Labrador Petroleum Directorate, July 1981, containing the Guidelines for the preparation of Terms of Reference for an Environmental Impact Statement for an Offshore Oil and Gas Development Program, Environmental Assessment Division, Department of Environment, Government of Newfoundland and Labrador

QUOTE

3. THE PRESENT AND FUTURE ENVIRONMENT (in the absence of the proposed project)

D. Physical and Chemical Oceanography

(iii) Ice Regime:

(a) Icebergs - physical characteristics: shape, size, mass, draft; population; drift; flux; scour; frequency, depth and distribution.

(b) Seasonal Ice Cover - ice pack: distribution, composition; first-year ice, multi-year ice, mechanical properties, ice movement.

8. CONTINGENCY PLANNING

A. Risk Analysis and Probability

(f) Risk associated with environmental hazards:

(ii) Oceanographic hazards - waves, currents, pack ice and icebergs, probability of occurrence, iceberg scour, stresses on structures and interference with operations.

UNQUOTE

Mobil's EIS was prepared in accordance with both guidelines mentioned above and submitted to a joint Canada-Newfoundland Review Panel, known as the Hibernia Environment Assessment Review Panel, on May 15, 1985

predict extreme values of physical characteristics of the ice and then there is the evaluation of contingency plans and countermeasures to be employed with such environmental hazards. These questions are addressed in Volumes I, II, IIIa and IIIb of the EIS with a detailed commentary on the ice regime being provided in Volume IIIa.

PHYSICAL OCEANOGRAPHY

The EIS states that information on sea ice and icebergs in the study area was obtained from 70 years of observations by the International Ice Patrol, 30 years of ice reconnaissance flights by the Canadian and American Governments, 15 years of satellite data, 5 years of observations from operating rigs, and historical records from coastal stations and ships. Specific studies analyzing these data were commissioned by the operator and are referred to in the EIS. An interview with personnel from the St. John's Office of Mobil Oil Canada, Limited produced additional information on recent studies of sea ice thickness (1985) and mechanical properties of icebergs (1984). Total contract value of ice related studies commissioned by Mobil Oil Canada, Limited on behalf of the participants in the Hibernia Development Project was estimated to be in excess of \$15M since 1980. This estimate did not include money spent under the programs supported by the Environmental Studies Revolving Fund nor the operational costs of existing ice monitoring programs (estimated to cost approximately \$10,000 per day).

Sea Ice

Analysis of sea ice types, concentrations and areal distribution in the study area based on 25 years of ice charts produced by the Atmospheric Environment Service (AES) was undertaken by NORDCO in 1980. Ice concentrations at the site were generally less than 6/10, in the years when the site was actually reached, half of which was young ice and half first-year ice. The maximum concentrations reported during the twenty-five years was over 9/10, nearly all of which was young or first-year ice. Work published in the open literature by Markham in 1980, also based on the ice charts of AES, was used to produce figures in the EIS for ice cover on the Grand Banks. These figures show the median position of the ice edge based on 11 years of data (1963-1973) and the extreme position of the ice edge based on 16 years of data (1959-1974).

Floe size is discussed in the EIS based on an oft-quoted paper by Blenkarn and Knapp in 1969 and on studies by NORDCO in 1980 and Bercha in 1981. Blenkarn and Knapp reported that the average floe size within 100 km of the southern edge of the pack will be less than 30 m. Large floes are unlikely to survive long on the Grand Banks because of wave action near the ice

margin. Average thickness of ice on the Grand Banks was reported to be less than 2 m by Blenkarn and Knapp in 1969. This value correlates well with the mean thickness of 2.8 m measured, at a more northerly site, near the Strait of Belle Isle by Fenco in 1981. Data provided by personnel from the St. John's office of Mobil Oil Canada, Limited indicated thicknesses in the 1 m range for the 1985 ice season. Volume II of the EIS quotes a design value of 1 to 1.5 m for average underformed thickness.

The majority of the Grand Banks ice pack consists of highly deformed but largely unconsolidated floes. Pressure ridging is not significant in ice concentration less than 10/10 (Zubov, 1945; Wadhams, 1980) and rafting does not seem to be other than unconsolidated. Hengeveldt reported four ice ridges on the Grand Banks in 1981 with a maximum height of 0.8 m. Smith reported an ice ridge height of 1 m to 2 m for a floe on the Grand Banks in 1921.

The wind drift component of the ice sometimes corresponds to the direction of flow of the Labrador Current. An example of this was recorded by NORDCO in 1980 where the maximum advance of the ice margin was over 50 km in one day (~0.6 m/s). A design value of 0.2-0.6 m/s is given in Volume II, for average speed and a maximum speed is quoted to be 0.9-1.0 m/s.

The EIS does not mention the results of mechanical properties tests of sea ice. However, a number of reports exist in the open literature, (see review papers by Weeks and Assur, 1976, and Weeks and Schwarz, 1977).

Conclusions

Sea ice should not pose any hazard to a GBS. Design of the articulated loading platform (ALPs) should incorporate the ability to resist normal sea ice conditions. Shuttle tankers and ice clearing vessels should also incorporate an appropriate level of ice strengthening. The possibility of small older ice floes on the Grand Banks should be considered even though they are seldom present and widely dispersed.

Icebergs

Estimates of the average annual production of medium sized (height: 15 to 45 m, length: 60 to 120 m, mass: 120,000 tonnes) or larger icebergs in Greenland range up to 40,000 while only some 300 to 400 icebergs generally survive to reach the Grand Banks (Murray 1969).

Records of the International Ice Patrol (IIP) show that the number of icebergs drifting south of 48°N each year is highly

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Records of the International Ice Patrol (IIP) show that the number of icebergs drifting south of 48°N each year is highly variable. No icebergs were reported south of this latitude in 1966 but 2100 were counted in 1984. However, the counts in recent years are probably biased towards greater numbers due to increased surveillance. Approximately 13 percent of the icebergs crossing 48°N cross the Hibernia area. NORDCO in 1980 reported that even during the peak of the iceberg season, no more than 30 icebergs will be found in any one degree square ($\sim 110 \text{ km} \times 80 \text{ km}$) on the Grand Banks. Monthly extreme iceberg limits based on 26 years of IIP data is summarized in the Ice Atlas Eastern Canadian Seaboard (Markham, 1980).

Iceberg size is characterized by several parameters: draft, mass, sail height, waterline length and shape. Percentage exceedance curves were constructed by Ice Engineering (1981a, 1981b, 1982, 1983), for the first four of these parameters, for icebergs found on the northern Grand Banks. Maximum values for draft, mass, sail height and longest waterline length were: 200 m, 10 Mt, 70 m and 320 m, respectively. However, values at the Hibernia site would be lower, bathymetric conditions would limit iceberg draft to 80 m.

Deterioration times for icebergs on the Grand Banks have been developed by the IIP. A value of 90 days is quoted for a large iceberg (over 30 m high and over 90 m long) when the surface seawater temperature is 0°C .

Drift velocities range from 0.0 to greater than 0.6 m/s, with a mean value of 0.2 m/s (Fenco, 1981a). A percentage exceedance curve of iceberg velocities for offshore Newfoundland waters north of 49° shows a maximum value of 1.4 m/s, (90% should have velocities less than 0.1 m/s).

Catalogues of iceberg scour on the Grand Banks have been compiled by Mobil Oil Canada, Ltd., the Bedford Institute of Oceanography (BIO) and the Centre for Cold Ocean Resources Engineering (C-CORE).

A comprehensive review of iceberg scour parameters based on theoretical and experimental studies by the authors and others was presented by Chari and Peters in 1981. Changes in dimensions of the scour due to currents and more recent scours were discussed by Barrie in 1983. Lewis and Barrie (1981) showed that most scours were preserved in areas of gravelly seabeds while few scours were preserved in sand seabeds. NORDCO (1984) conducted an analysis of scour data from a corridor that included the Hibernia Field. The total number of scours identified was 101, the maximum scour depth was 1.6 m and the maximum scour width was 60 m. According to EIS, the greatest scour depth documented for the Grand Banks is 7.0 m in 60 m deep water approximately 90 km north of the P-15 wellsite. The longest scour length is reported to be 7.2 km, in 104 m deep water, approximately 50 km southeast of the P-15 wellsite.

The statement "Corridor 8, which included the Hibernia Field, has a frequency of scouring of $0.074/\text{km}^2$ " requires a little clarification.

The EIS does not mention any mechanical properties tests of glacial ice. However, personnel from the St. John's office of Mobil Oil Canada, Ltd. did provide some details of recent large scale in-situ tests of compressive strength of a grounded iceberg at Pond Inlet, Baffin Island. These tests incorporated experience in ice testing accumulated over the years and incorporated measurement of load, strain rate, ice temperature and structure. Earlier small scale uniaxial tests were performed in 1981 off Labrador and Greenland. Drop tests were used to investigate the effect of high strain rates. The effect of scale was explored in experiments off Hans Island and the 1984 tests showed the effect of a range of contact areas. Design parameters for icebergs are quoted, in the EIS, to be 1.49GN.m for maximum kinetic energy and 7MPa for uniaxial compressive strength (over areas larger than 0.022m^2).

Conclusions

A GBS must withstand all iceberg impacts and thus be designed with both global and local ice pressures in mind. Particular attention should be paid to the confinement effect between "wedges" in the ice belt (assuming the GBS configuration

7

is similar to that shown in the EIS). The possibility of local damage, to the GBS, due to local ice pressure should also be fully investigated with a view to provide suitable repair procedures. Continuation and upgrading of existing ice management programs (possibly including direct attachment towing and the use of nets as well as the use of improved radars) is suggested to mitigate the possibility of iceberg impact and scour. The threat of iceberg scour could be further mitigated, as suggested in the EIS, by installing the well-head control valves below maximum scour depth and possibly burying or including safety connections in the flowlines and gathering lines. It is assumed that marine traffic will not be designed to withstand impacts by icebergs. However, the ALPs should be designed to withstand impacts by bergy bits and normal sea-ice conditions. A suitable flushing system to displace crude oil out of the tanker loading facilities would have to be designed to operate before damage due to large icebergs or extreme sea ice cover could take place.

CONTINGENCY PLANNING

During the Hibernia exploration phase, Mobil Oil Canada, Ltd. has had in place extensive assessment and prediction programs on the physical environment in the vicinity of the drilling platforms. These operational programs provide some of the specialized design data required to design and fabricate production platforms capable of operating year-round in the environment at Hibernia.

At present, dedicated weather observers on board the offshore platforms collect physical environmental data in accordance with the standards set out by AES. A similar program is anticipated to continue during the Hibernia development and production phases. The data as it relates to ice includes sightings, iceberg shape, size, position and drift rate. A series of alert zones is set up for each sighting, and predictions are made as to when the ice will reach the boundary of each zone. Specific actions such as closer monitoring, towing, well security, or rig movement (current exploration drilling) are called for when the ice reaches each zone. During the winter of 1983-84 the companies drilling on the Grand Banks participated in a joint regional ice management system to detect, forecast and manage ice and icebergs. X-band and S-band radar systems are employed on the rigs while side-looking airborne radar (SLAR) and synthetic aperture radar (SAR) is used on fixed-wing aircraft.

Ongoing research in the area of ice detection, handling, and forecasting include programs funded by the Environmental Studies Revolving Fund (ESRF), by AES and by Mobil Oil Canada, Ltd. The use of bi-static radar and Doppler radar is being evaluated for iceberg detection and research is being conducted on direct attachment towing of icebergs. SLAR and SAR observation programs, ice data analysis systems, ice drift models, passive and active microwave systems for sea ice detection, nondeterministic global model of iceberg scour depths, are examples of some of the current research topics.

Conclusions

A well established sea ice and iceberg surveillance program exists and should be continually maintained and upgraded. Good detection capability is essential for marine support operations to the GBS and for further exploration drilling in nearby blocks. A continued joint ice management program with other oil companies operating on the Grand Banks would appear to have many advantages. It would appear that improved iceberg towing techniques should continue to be developed to enable icebergs to be reliably towed away from the production area in all weather conditions.

CLOSURE

The section of the EIS on sea ice and icebergs gives an overview of an area in which a vast amount of effort has been expended by the proponent. This effort has often been put into confidential studies, but has always been made available to both the Governments of Canada and Newfoundland and Labrador on a need-to-know basis. Complementary research, which has been undertaken by a variety of government departments and universities, that has been published in the open literature tends to confirm the statements made in the EIS.

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